REPORT for 2007

New Brunswick Air Quality Monitoring Results

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NEW BRUNSWICK

AIR QUALITY MONITORING RESULTS

FOR THE YEAR

2007

Technical Report T-2009-02

Sciences and Reporting Branch
New Brunswick Department of Environment
P.O. Box 6000
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2009

EXECUTIVE SUMMARY

This report summarises air quality monitoring data in New Brunswick for 2007. The report is intended to provide a convenient summary of air quality results for general public information, with emphasis on air quality assessment in relation to existing air quality standards and objectives. Long-term trend data are also presented for representative sites.

Air quality has been monitored in New Brunswick since the 1960s, when several short-term studies were carried out in Saint John. The emphasis on air monitoring has steadily increased over the years. Air contaminants presently covered by provincial objectives were measured at 59 sites across the province during 2007. Acid rain was measured at 13 additional sites. Volatile organic compounds and mercury in air were also monitored at some locations.

This report presents summary statistics from all monitoring sites in the province, with additional statistical data (in chart form) in an Appendix. Details are also provided in the report on the quality assurance procedures used in the provincial air quality system.

During 2007, there were no exceedances of New Brunswick air quality objectives for nitrogen dioxide or carbon monoxide at any of the provincial monitoring sites. In 2007, exceedances of the 1-hour standard for sulphur dioxide were lower in Saint John than in 2006, and very infrequent elsewhere. Ozone exceedances occurred on one day for a total of four hours, affecting the Fundy Park and Norton sites. The number of exceedances of total reduced sulphur (TRS) increased in Nackawic in 2007 as they did in Saint John. TRS values in the Miramichi area were similar to 2006. Measurement of fine particulate matter began at Castle Street (Saint John) in June 2007. Levels of $PM_{2.5}$ and ozone remained below the Canada-wide Standards, in advance of the 2010 achievement date. Total volatile organic compounds concentrations in 2007 were lower at both Forest Hills and Champlain Heights, compared with 2006.

An examination of air quality trends at sites with long records indicates that since the late 1970s and 1980s, air quality has improved for all pollutants currently being measured, with the possible exception of ground level ozone, for which no clear trend is apparent. Annual average levels of sulphur dioxide have decreased significantly over the past 15-20 years. The long term levels of carbon monoxide and nitrogen dioxide have also decreased.

Although acid deposition has generally declined since the early 1990s, its effects continue to be of concern in the province, particularly in south-western districts, which is the area of the province that is most sensitive to the effects of acid rain. Sulphate in precipitation, a key indicator of acid rain, was moderately lower in 2007 compared to 2006. The trend overall is downward since 1989, although this downward trend appears to have moderated in recent years.

In 2007, the Department acquired and outfitted a new trailer to replace the original mobile monitoring vehicle. The new mobile went into service in December 2007.

Feedback

We are interested in your opinions and feedback on this report. All suggestions will be considered, and if possible, incorporated in future reports. You may contact the Sciences and Reporting Branch at (506) 444-2644, by fax at (506) 453-2265 or e-mail Randy Piercey at Randy.Piercey@gnb.ca with any comments. The layout and some sections of text contained in this report are courtesy of previous annual reports prepared by Rob Hughes.

Acknowledgements

Thanks to Cindy Breau and Stephanie MacDougall of Department of Environment (DENV) for compiling the report. Thanks to Reid McLean for producing the maps in the report. Numerous staff within DENV and from the industries operating monitoring networks provided valuable help with data provision. Special thanks to Stan Howe and Eric Blanchard of DENV for operation of the provincial monitoring sites, and the staff of the Saint John regional office of DENV for assistance with site operation in the Saint John area. Thanks to Mallory Gilliss (DENV), Stephanie MacDougall (DENV) and Karen Pelletier (NB Power) for operation of the acid rain network.

Thanks to Randy Piercey, Don Murray, Don Grass, Eric Blanchard, Don Fox, Cathy Dubee, Sean Fortune, Melissa Martin and André Fortin for reviewing and providing comments on the report. Thanks to Eric Blanchard and Mathieu Doucet for reviewing the French version of the report.

Thanks are also extended to site operators in the provincial acid rain monitoring network, including Alphonse Boissoneault (St. Maure), Lynn Gardiner and Keith Rees (Canterbury), Marie-Jean Cormier (Paquetville), Daniel Boudreau (Robertville), Jeffrey Suttie (Pennfield), Robbie Parish and Bill Miller (Nictau), Murray MacFarlane (Holtville), Wanda and Bart Petley (Harcourt), Hugh and Darilene MacGillivray (Lakewood Heights), Mae and Edward Stewart (Trout Brook), Gary and Nancy Kierstead (Coles Island), Luanne Brawn (South Oromocto Lake) and Thane Watts and staff (Fundy Park).

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List of Acronyms and Abbreviations

DENV	Department of Environment
ppb	Parts per billion
ppm	Parts per million
$\mu g/m^3$	Micrograms per cubic meter
CO	Carbon monoxide
SO_2	Sulfur dioxide
NO_2	Nitrogen dioxide
TRS	Total reduced sulfur
NO_x	Nitrogen oxides
TSP	Total suspended particles
VOC	Volatile organic carbon
$PM_{2.5}$	Fine particulate matter
BAM	Beta attenuation method
TEOM	Tapered element oscillating microbalance
CWS	Canada-wide Standard
NAPS	National Air Pollution Surveillance

1. INTRODUCTION

This report summarises air quality information gathered during 2007 at monitoring locations across New Brunswick. A summary of data from the provincial acid precipitation monitoring network is also included. The report focuses on ambient (i.e. outdoor) air, which provides an indication of environmental quality in terms of air pollution.

Air quality objectives used in New Brunswick are listed on page three of this report. Additional information on air quality standards and objectives, sources and effects of air pollutants, climate change and air quality may be found on the Department of the Environment (DENV) web site at:

http://www.gnb.ca/0009/0010-e.asp

2. MONITORING NETWORKS

Compliance with air quality objectives or regulatory standards is determined by monitoring, for the most part on a continuous basis.

Monitoring locations are selected so that they will provide information that is representative of the surrounding area. In cases where there is a known pollutant source, monitors are often distributed in locations where the impact is expected to be greatest. Such locations are typically selected based on the results of computer dispersion models. These are computer programs which simulate the behaviour of plumes, or discharge streams of gases as they are released from smokestacks. Such models take into account the complete variety of weather conditions which may be experienced in the area where the stack is located, as well as the nature of the local landscape.

In New Brunswick, large industrial emission sources, such as electricity generating stations or pulp mills, are legally required by the Department of the Environment (DENV) to carry out ambient air quality monitoring as prescribed in their Approvals to Operate under the Clean Air Act. Such Approval conditions also detail the required equipment specifications, locations and reporting frequency. In such cases, the monitoring equipment and maintenance procedures are checked periodically by DENV staff or independent auditors, to ensure the required standards for operation and technical accuracy are being met.

In the case of air pollutants which are transported long distances, and which may be found in rural, as well as urban areas, DENV establishes and operates its own monitoring sites. The Department also maintains sites in areas where there are multiple large industrial emission sources, such as Greater Saint John.

Additionally, there are 13 provincial acid precipitation monitoring sites augmented by one federally-operated site in New Brunswick (at Harcourt, in eastern New Brunswick).

Federal support is also provided for the operation of several other air quality monitoring sites across the province (through the National Air Pollution Surveillance (NAPS) program).

The location of air quality monitoring in New Brunswick are shown in Figure 1. More detail on the exact location of each site is provided in the following sections.


Dalhousie
Bathurst
Edmundston
Moncton
Fredericton
Saint
John

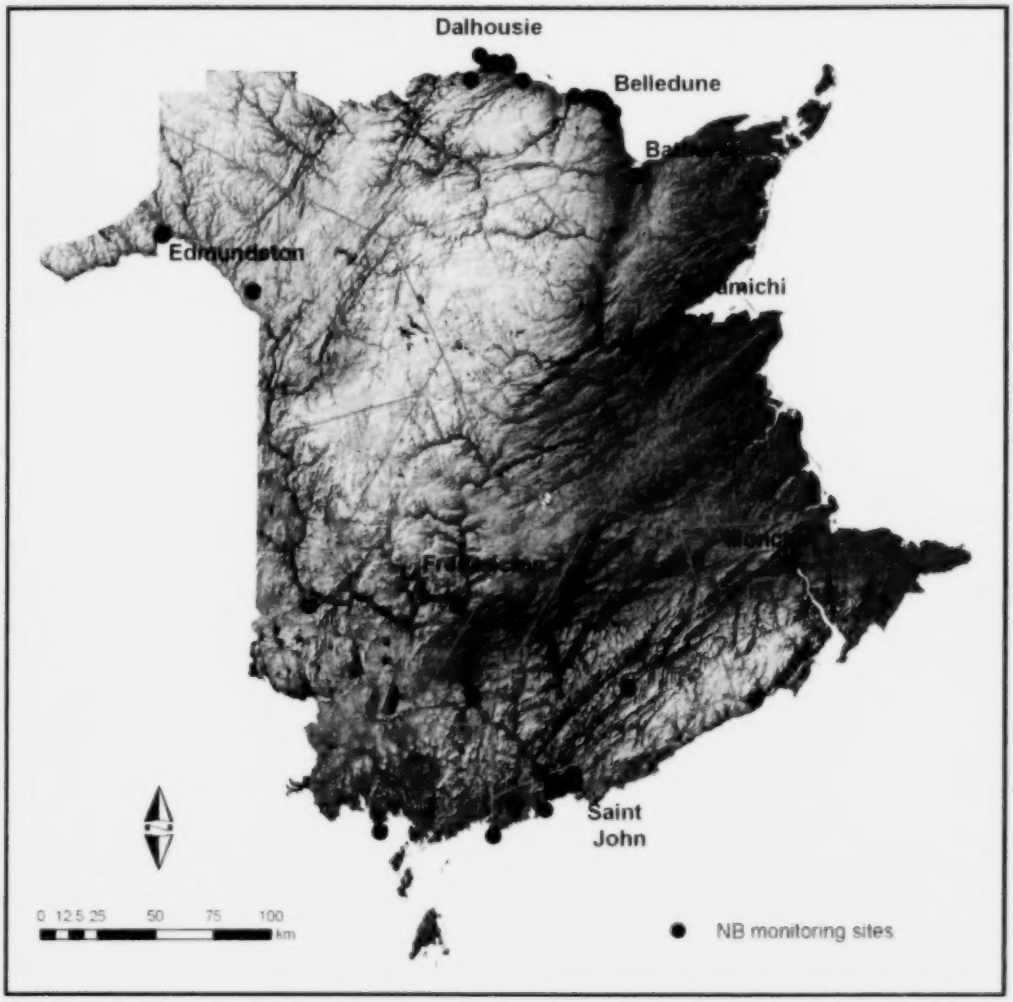

Figure 1. Locations of air quality monitoring sites in New Brunswick, 2007.

The following table lists the New Brunswick Air Quality Objectives for five air pollutants: carbon monoxide (CO), hydrogen sulphide (H_2S), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and total suspended particulate (TSP). These Objectives are established under the Clean Air Act that includes a provision for required annual reporting to the Legislative Assembly on achievement of air quality objectives.

New Brunswick Air Quality Objectives				
Pollutant	Averaging period			
	1 hour	8 hour	24 hour	1 year
Carbon monoxide	30 ppm	13 ppm		
Hydrogen Sulphide	11 ppb		3.5 ppb	
Nitrogen dioxide	210 ppb		105 ppb	52 ppb
Sulphur dioxide*	339 ppb		113 ppb	23 ppb
Total suspended particulate			120 µg/m^3	70 µg/m^3

* The standards for sulfur dioxide are 50% lower in Saint John, Charlotte, and Kings counties.

As there is no New Brunswick Air Quality Objective for ozone (O_3), the National Objectives for ozone are included below.

Elsewhere in the report, reference is made to other air quality standards or objectives from other jurisdictions (provincial, national or international) to aid in the interpretation of air quality conditions in New Brunswick.

Determining compliance with the Canada-wide Standard (CWS) for $PM_{2.5}$ of 30ug/m^3 (not required before 2010) is a complex calculation derived from the 98th percentile of daily averages in each year, averaged over three consecutive years. In the absence of another benchmark for $PM_{2.5}$, and for purposes of this report, $PM_{2.5}$ values are compared to the CWS level of 30 ug/m^3.

National Ambient Air Quality Objectives for Ozone (ppb)			
Averaging period	Desirable Level	Acceptable Level	Tolerable Level
1 Hour	51	82	153
24 hours	15	25	-
Annual	-	15	-

3. AIR QUALITY MONITORING RESULTS FOR 2007

Results are presented for each monitoring network in the Province. The locations of the monitoring sites are shown on regional scale maps. The numeric results are shown in tables, and further details in chart form appear in Appendix 1. Explanatory notes are provided on each network, and a discussion of the results for each network is included.

A. SAINT JOHN

The greater Saint John area has the longest history of air quality monitoring in New Brunswick, beginning in 1961. Since that time, air quality has been monitored at more than 30 different locations in the city and surrounding area. A total of 16 air quality monitoring sites, which were active in 2007, are shown in Figures 2 and 3. Figure 3 shows four sites established in connection with the Coleson Cove generating station.

Most of these sites are electronically linked to a central computer at the DENV central office in Fredericton. The system communicates with the monitors a minimum of once each hour and obtains the latest readings. The readings are then added to the existing data archive and some are used to prepare IQUA (Index of the Quality of the Air) public information messages, as well as to determine the nature of any abatement actions required by industries if concentrations rise above pre-determined trigger values. Such episode control systems are specified in various Approvals to Operate issued to major emission sources by the Department.

On the City's west side, three monitoring sites for total reduced sulphur (TRS) are operated by Irving Pulp and Paper Ltd. DENV also operates a site at the Hillcrest Baptist Church off Lancaster Avenue, at which SO_2, TRS, O_3 and $PM_{2.5}$ are monitored. In east Saint John, four sites for SO_2, two for $PM_{2.5}$, one for NO_2 and one for TRS (added in the fall of 2007) are operated by Irving Oil Ltd., as required by the company's operating approval, and results are sent electronically to the Department's data system.

To the west, outside the city, NB Power maintains sites at Grand Bay-Westfield (SO_2), Musquash (SO_2), Manawagonish Road (SO_2 and $PM_{2.5}$) and Lorneville (SO_2 and $PM_{2.5}$).

DENV also maintains sites at Forest Hills and Champlain Heights in east Saint John, and at the Customs Building and Castle Street in the uptown area. At Forest Hills, there are monitors for O_3, SO_2, NO_x, $PM_{2.5}$, volatile organic compounds (VOCs) and others (aldehydes and PAH). A TRS instrument was added in late 2006. At the Champlain Heights School, SO_2, TRS, NO_2,

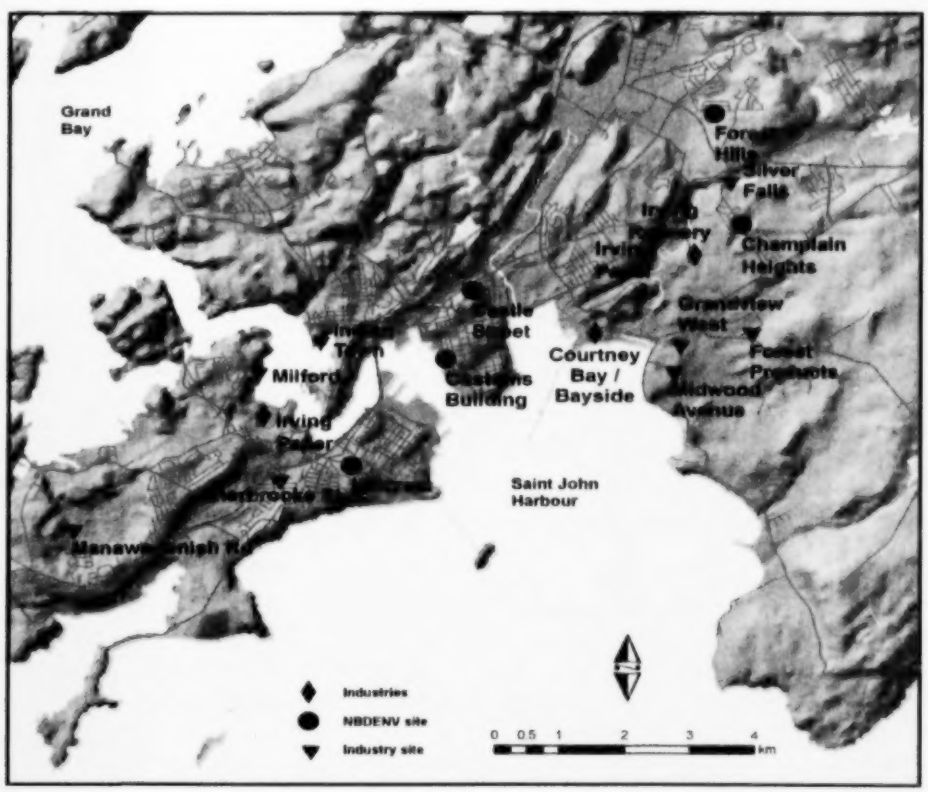

Figure 2. Air quality monitoring sites in Saint John, New Brunswick, 2007.

VOCs, $PM_{2.5}$ and aldehydes are measured. The Customs site has monitors for O_3, SO_2, NO_2 and CO. A new site on Castle Street monitors $PM_{2.5}$ as of June 2007.

A.1 Carbon Monoxide

This pollutant is monitored at the Customs Building site to provide data representative of the Saint John centre. Peak hourly values in every month seldom exceeded 2.0 ppm, and thus were well below the applicable objective of 30 ppm. In addition, there were no exceedances of the 8-hour objective of 13 ppm.

A.2 Nitrogen Dioxide

There were no exceedances of the 1-hour objective of 210 ppb at any sites (Forest Hills, Customs Building, Champlain Heights School or Grandview West 2) during 2007. Neither were the 24-hour objective (105 ppb) or the annual objective (52 ppb) exceeded.

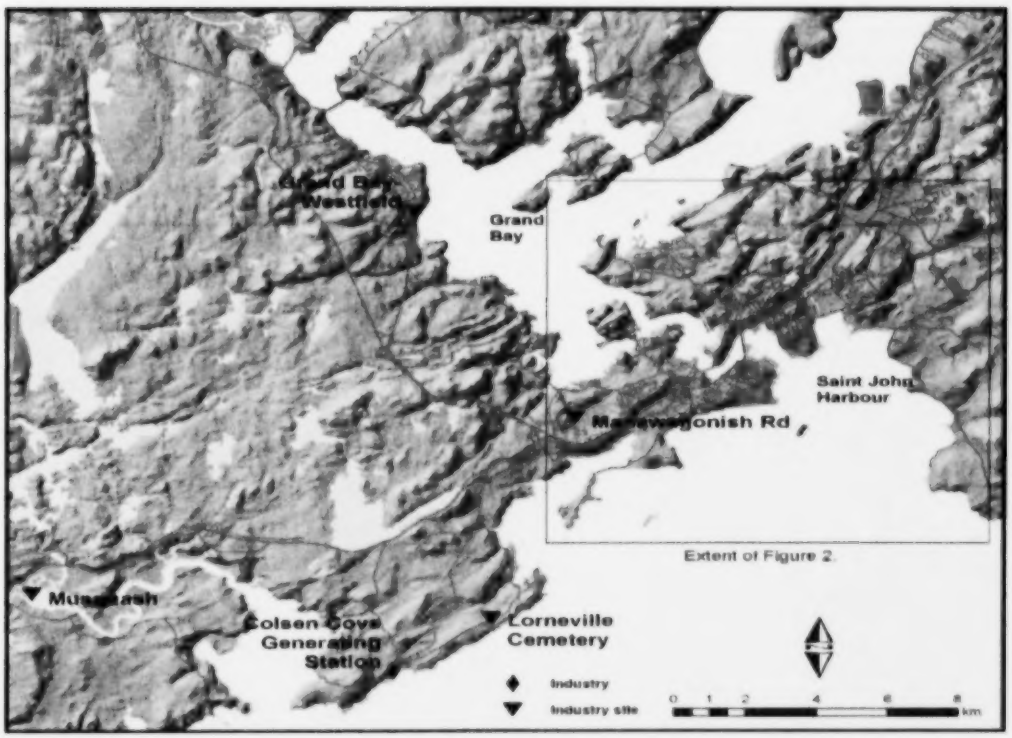

Figure 3. Locations of NB Power Coleson Cove network air quality monitoring sites in New Brunswick, 2007.

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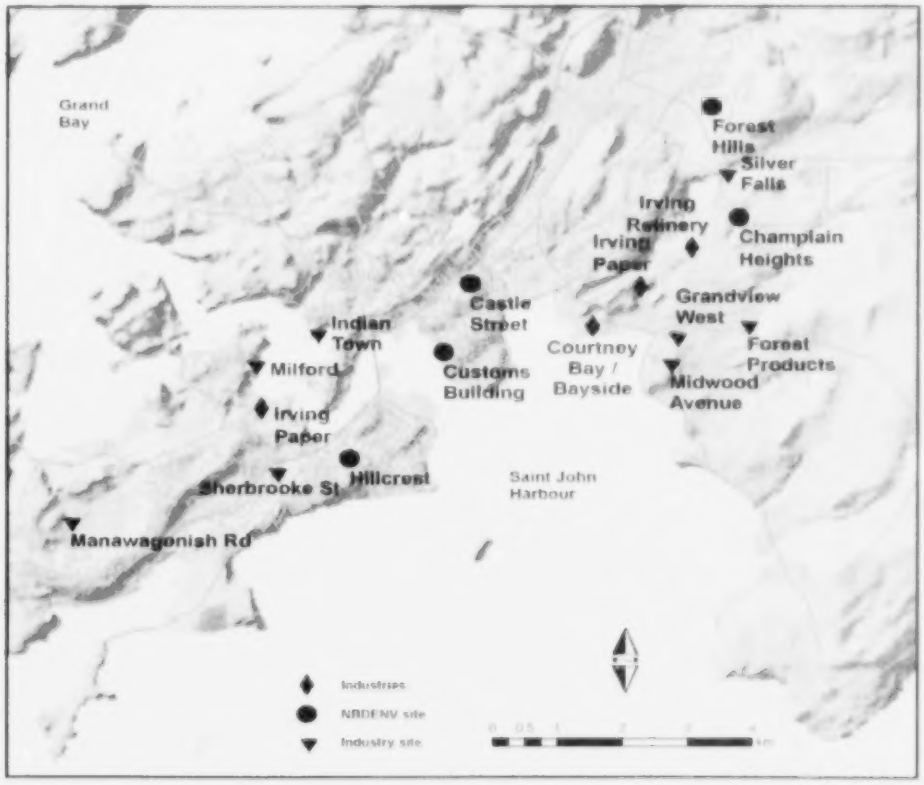

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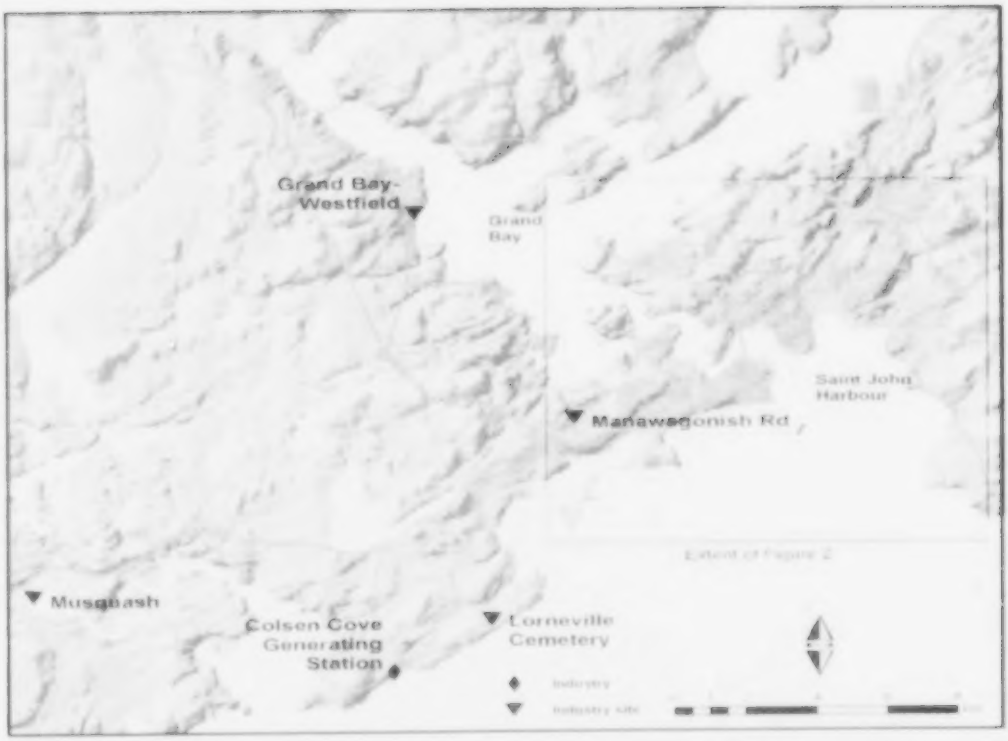


Figure 3 Locations of NB Power Coleson Cove network air quality monitoring sites in New Brunswick, 2007.

A.3 Sulphur Dioxide

Exceedances for SO_2 are summarised in Table 1. During 2007, the number of exceedances was lower than 2006 except at the Forest Hills site where five exceedances of the 1-hour objective occurred. Many of these exceedances were attributed to problems in the refinery's Sulphur Block, the main area for sulphur recovery, during the summer of 2007. Irving Oil was issued an administrative penalty following an investigation by the DENV Enforcement Services Branch as a result of elevated sulphur dioxide emissions during this time period.

At the Grandview West site the number of exceedances of sulphur dioxide continued to decline in 2007 in comparison to previous years.

In the Coleson Cove Network, there were no exceedances of SO_2.

A.3.1 Sulphur Dioxide Episode Control

An episode control program is in place to prevent ambient SO_2 reaching undesirably high levels in Saint John. Control actions are initiated by major industries in the city in response to measurements made at the fixed monitoring sites.

These control actions are made mandatory by being incorporated into the relevant Approvals to Operate issued by DENV. The episode control plans themselves are subject to continual review. DENV meets regularly with staff of the major industries in the city to review compliance with respect to SO_2.

All exceedance events are examined in detail and any shortfalls in the nature and extent of response action are addressed. DENV staff sometimes request emission control actions separate from, or in addition to, those specified in the episode control plans. Such action may be warranted due to unusual conditions, such as poor dispersion, or during periods when smog advisories are in effect.

Some of the ways in which industries respond to rising levels of SO_2 include switching to lower or near-zero sulphur fuels, and reducing production rates or electricity generating rate. Response action is initiated when concentrations reach 80 ppb, approximately half the 1-hour objective of 170 ppb.

Table 1. Exceedances of provincial objectives for SO_2 in Saint John, 1998-2007.

	Midwood Avenue	Champlain Hts	Customs Building	Forest Hills	Forest Products	Hillcrest	Grandview West 1	Silver Falls
1 HOUR OBJECTIVE								
2007	0	0	0	5	0	0	11	0
2006	2	1	0	0	0	0	61	0
2005	0	3	0	1	0	0	135	4
2004		0	2	0	0	0	153	2
2003		1	0	1	2	0	153	10
2002		0	0	0	0	0		0
2001		1	0	0	0	0		4
2000		4	3	1	1	2		3
1999		0	0	2	4	0		0
1998		4	3	4	11	0		1
24-HOUR OBJECTIVE								
2007	0	0	0	35	0	0	13	0
2006	19	0	0	0	0	0	255	0
2005	0	0	0	0	0	0	331	16
2004		0	0	0	0	0	504	31
2003		47	0	23	3	0	429	117
2002		0	0	0	0	23		14
2001		4	0	0	0	0		47
2000		35	0	0	0	0		0
1999		0	0	25	25	0		0
1998		26	31	9	119	0		0

A.4 Fine Particulate Matter

Forest Hills - TEOM

The Canada-wide Standard for $PM_{2.5}$ is 30 micrograms per cubic metre ($\mu g/m^3$) based on a daily 24-hour average. In 2007, the TEOM operated from January to June, at which time it was permanently retired. During the 6 month period, there were no days having a daily average exceeding 30 $\mu g/m^3$.

Forest Hills - BAM

There were four days where the daily average exceeded 30 $\mu g/m^3$ during 2007. In addition, there were 82 hours having a running 24-hour average exceeding 30 $\mu g/m^3$. The exceedances occurred in June, July, and September. Summary statistics are shown in Table 2.

Champlain Heights - BAM

Results are summarised in Table 2. There were no days during the year having a daily average exceeding 30 $\mu g/m^3$.

Castle Street - BAM

A $PM_{2.5}$ monitor was installed on Castle Street in June 2007. However after review, the data in 2007 was determined to be invalid due to a technical issue and no results are reported for 2007.

Hillcrest-BAM

The annual average for $PM_{2.5}$ at Hillcrest was 7 $\mu g/m^3$ and there was one day in which the daily average exceeded 30 $\mu g/m^3$

Coleson Cove Network - BAM

During 2007, one day had a daily average exceeding 30 $\mu g/m^3$ at both Lorneville Cemetery and Manawagonish Road sites (Appendix 1). There were 22 hours having a running 24-hour average exceeding 30 $\mu g/m^3$ at Lorneville Cemetery and 42 hours at Manawagonish Road.

TEOM and BAM

Continuous monitoring of paticulate has been routinely carried out in New Brunswick using two methods of measurement referred to as TEOM and BAM.

TEOM stands for tapered element oscillating microbalance. The methods senses the change in mass of a filter, mounted on a vibrating quartz rod (the tapered element).

BAM stands for beta attenuation method. This method directs a beam of beta radiation at a paper filter tape through which the air sample is drawn. The amount of weakening or scattering of the beam can be related to the particle mass on the tape.

Over the past few years DENV has replaced most of its older TEOM units with BAM.

Table 2. Monitoring results for $PM_{2.5}$ (BAM), Saint John Network, 2007.

	Forest Hills	Hillcrest	Champlain Hts	Castle St.	Lorneville*	Manawagonish Rd.*
Annual average (µg/m³)	7.0	6.7	8.2	**	5.4	7.3
98th percentile value (CWS)	26.0	17.8	17.8	**	17.1	18.8
Days with daily average >30 µg/m³	4	1	0	**	1	1
Hours with running 24-hour average >30 µg/m³	82	23	0	**	22	42

* Coleson Cove Network
** Data invalidated

A.5 Ground Level Ozone

O_3 was monitored at three sites in the city during 2007: Forest Hills, Customs Building and in West Saint John at Hillcrest Church. During 2007, there were no exceedances of the 1-hour National Ambient Air Quality Objective for O_3 of 82 ppb in the Saint John Network. Statistics were also calculated in reference to the Canada-wide Standard for O_3, which is based on a maximum daily 8-hour average, and is set at 65 ppb. No exceedances of this level were recorded in 2007.

Further details on ground level O_3 follow in section 8, where additional results for all O_3 monitoring sites are summarised.

A.6 Total Reduced Sulphur

TRS is monitored at Champlain Heights, Hillcrest and Forest Hills (beginning in late 2006) by DENV, as well as three sites operated by Irving Pulp and Paper (Milford, Indian Town and Sherbrooke St.) and one site by Irving Oil at Midwood Avenue where TRS was added in the fall of 2007.

In 2007, there were a few exceedances of TRS recorded at several sites in east and west Saint John: Forest Hills, Champlain Heights, Indiantown and Milford. Exceedance occurrence since 1998 are summarized in Table 3 and further information on TRS levels in 2007 can be found in Appendix 1.

Note: for evaluation of TRS data, and in the absence of a specific objective for TRS, reference is made to the provincial objectives for hydrogen sulphide. Results since 1998 are summarised in Table 3.

Table 3. Exceedances of provincial objectives for TRS (as H_2S) in Saint John, 1998-2007.

		Forest Hills	Champlain Hts	Midwood Avenue	Hillcrest	Indian Town	Milford	Sherbrooke St.
2007	1-hour	7	2	0*	0	3	2**	0**
2006	1-hour		7		M	0	0	0
2005	1-hour		2		0	0	3	0
2004	1-hour		3		M	0	0	0
2003	1-hour		0		0	0	0	1
2002	1-hour				0	2	0	0
2001	1-hour				0	0	1	9
2000	1-hour				3	2	0	4
1999	1-hour				1	6	0	0
1998	1-hour				17	29	23	16
2007	24-hour	33	14	0*	0	0	0**	0**
2006	24-hour		21		0	0	0	0
2005	24-hour		0		0	0	22	0
2004	24-hour		0		M	0	19	0
2003	24-hour		0		0	0	0	0
2002	24-hour				0	11	0	0
2001	24-hour				0	0	5	684
2000	24-hour				18	47	12	29
1999	24-hour				20	26	0	0
1998	24-hour				258	277	136	157

M = missing data

* Monitoring began in October

** Not monitoring from January-April

A.7 Volatile Organic Compounds (VOCs)

VOCs have been measured at Forest Hills in east Saint John since 1992. Measurements have also been made for the same period of time at Point Lepreau, approximately 40 km southwest of the city. The Lepreau site is predominantly upwind of Saint John and serves as a control or reference site, representative of rural southern New Brunswick. In July 2000, VOC sampling was begun at Champlain Heights in east Saint John. The monitoring program for VOCs is a collaborative one between DENV and Environment Canada. DENV staff maintain the monitoring sites and set up the equipment to take samples (normally every 6 days). Environment Canada performs the analyses on the collected air samples.

Sites in Saint John collect one 24-hour sample every 6 days and the rural site at Point Lepreau collects a 4-hour sample beginning at noon, every 3 days. All samples are analysed for over 150 compounds, which include VOCs which are involved in the formation of O_3, as well as VOCs which may be of interest for other reasons. For example, they may be indicators of various kinds of industrial activity, or they may be potentially of concern in their own right (for example, substances which are known to be carcinogenic, such as benzene). Some other VOCs which are measured are found at similar concentrations regionally or even globally (such as several CFC compounds). These substances are of key interest in atmospheric research.

There are no national ambient air quality standards for VOCs in Canada. Results can be compared against guidelines published by other agencies, and examined over time to look for trends, as well as differences between sites.

Table 4 lists results for 2007 for selected VOCs, compared with guidelines recommended by various agencies. This subset of VOCs contains compounds which have traditionally been classified as "air toxics", and which are considered potentially harmful to human health. The first line of the results table also shows the average concentration taking into account all VOCs measured at each site (total VOC).

Levels of VOCs measured at Champlain Heights are typically higher than at Forest Hills, and this was true for 2007. Both sites had higher concentrations of most VOCs than the Point Lepreau site. However, the maximum 24-hour average for total VOC was higher at Forest Hills than Champlain Heights in 2007.

For the selected VOCs for which guidelines could be referenced, concentrations at both monitoring sites were found to be below these targets at both sites, in most cases by a substantial margin. The annual guideline for benzene published in the United Kingdom (5 ppb) has a long-term target of 1 ppb (EPAQS, 1994; HMSO, 2000). The Swedish guideline is 1.5 ppb with a compliance date of 2010 (Swedish EPA, 2003). Benzene is emitted from motor vehicles and is a component of gasoline. In Saint John, the petroleum refinery and other industries would also contribute to ambient concentrations. Additional analysis of VOC data is included in section 8.

Table 4. Monitoring results for Volatile Organic Compounds, 2007.

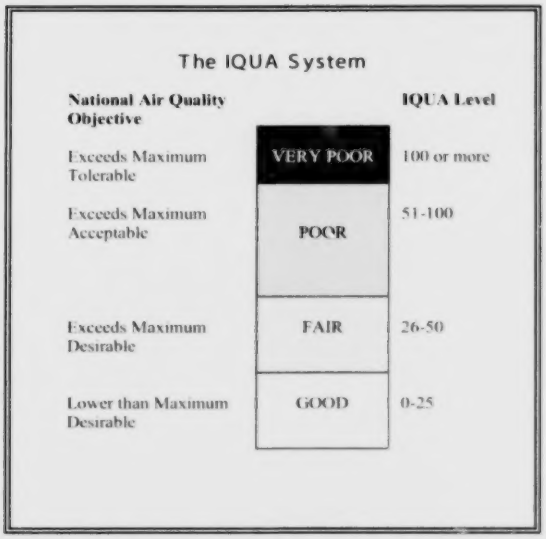
VOC	Max 24-hour averages (ppb)		24-hour guidelines (ppb)	Annual averages (ppb)			Annual Guidelines (ppb)
	Forest Hills	Champlain Hts		Forest Hills	Champlain Hts	#Point Lepreau	
Total VOC	271.0	118.7		28.9	50.8	5.4	
1,3 butadiene	0.14	0.16		0.03	0.03	0.00	1 (UK)
Benzene	0.93	1.62		0.24	0.66	0.04	1.5 (UK, (Sweden)
Toluene	3.41	3.77	63 (WHO) 106 (AB) 24 (ON)	0.44	1.20	0.19	10-100 (Sweden)
Ethylbenzene	0.37	0.84	4464 (WHO) 227 (ON)	0.05	0.23	0.03	
Xylenes	1.03	2.37	1013 (WHO) 161 (AB) 522 (ON)	0.14	0.63	0.08	
Styrene	0.25	0.20	56 (WHO) 94 (MB) 93 (ON)	0.03	0.04	0.10	
Chloromethane	0.63	0.62	3344 (ON)	0.54	0.51	0.54	
Vinyl chloride	0.00	0.00	0.4 (ON)	0.00	0.00	0.00	
1,1 dichloroethylene	--	0.00		--	0.00	--	
Dichloromethane	0.48	0.21	792 (WHO) 62 (ON)	0.09	0.08	0.10	100-250 (Sweden)
1,2 dichloroethane	0.02	0.03	159 (WHO)	0.01	0.02	0.01	100-150 (Sweden)
Carbon tetrachloride	0.13	0.12	0.4 (ON)	0.09	0.09	0.09	
1,2 dichloropropane	0.00	0.00		0.00	0.00	--	
Trichloroethylene	0.01	0.01	21 (ON)	0.01	0.00	0.00	100-200 (Sweden)
1,1,2 trichloroethane	0.00	0.00		0.00	0.00	0.00	
Ethylene dibromide	0.00	0.00	0.4 (ON)	0.00	0.00	--	
Tetrachloroethylene	0.03	0.03	34 (WHO)	0.01	0.01	0.00	
1,1,2,2 tetrachloroethane	0.00	0.00		0.00	0.00	--	
Formaldehyde	--	--	52 (ON)	--	--	--	
Acetaldehyde	--	--	274 (ON)	--	--	--	
MTBE	0.08	0.01		0.01	0.00	--	

Notes: The guidelines marked with an asterisk (*) are for a weekly period. AB =Alberta; ON = Ontario; MB = Manitoba. Sources: WHO (World Health Organisation): 1987, 1994,1996 & 1997; Swedish standards: OECD, 1995; Swedish EPA, 2003. UK standards: HMSO, 2000. Alberta, Ontario, and Manitoba : Provincial Environment Departments. # Data at Pt Lepreau are collected for 4 hour samples, sampling every third day, starting at noon AST. The other sites are based on 24-hour samples every 6th day.
For additional information, see also Table 25 on page 51.

A.8 Index of the Quality of the Air (IQUA)

The IQUA system has been used in Saint John for over 25 years to help make air quality monitoring results easier to understand. Results for each pollutant measurement are expressed on a scale from 1-100, and classed as "good" (index 0 to 25), "fair" (26 to 50), "poor" (51 to 100) or "very poor" (over 100). Each of the categories is based on the National Air Quality Objectives. For example, "good" air quality indicates that pollutants are in the "desirable" range as defined by the air quality objectives. Values in the "fair" range are above the desirable, but below the acceptable objective. IQUA information is available via the DENV web site:

http://www1.gnb.ca/0355/0003/0000.asp



This web page is updated three times per day. IQUA information is also accessible by phone via recorded message (dial (506) 636-4991 in the Saint John area). The recorded message is updated hourly.

For each hour, the IQUA index is computed for each pollutant measured at the site. The value reported is the highest of each of the individual values. For example, if two pollutants are in the "good" range and one is in the "poor" range, then the index for the hour would be reported as "poor". In addition, the pollutant responsible for determining the overall index value is usually identified.

Summary statistics are given in Table 5 for the three designated IQUA sites in Saint John: Customs Building (uptown), Forest Hills (east) and Westside Station (west). Table 5 shows the percentage of time logged in each IQUA category. It is apparent that the vast majority of the time, air quality was in the "good" category during 2007 (more than 98% of the time). The percentage of hours in the "fair" range was approximately 1% or less at all sites, and the small percentage of hours in the "poor" range at Forest Hills was due to exceedences of SO_2 reported on July 26 and 27.

Table 5. IQUA Summary for Saint John sites, 2007.

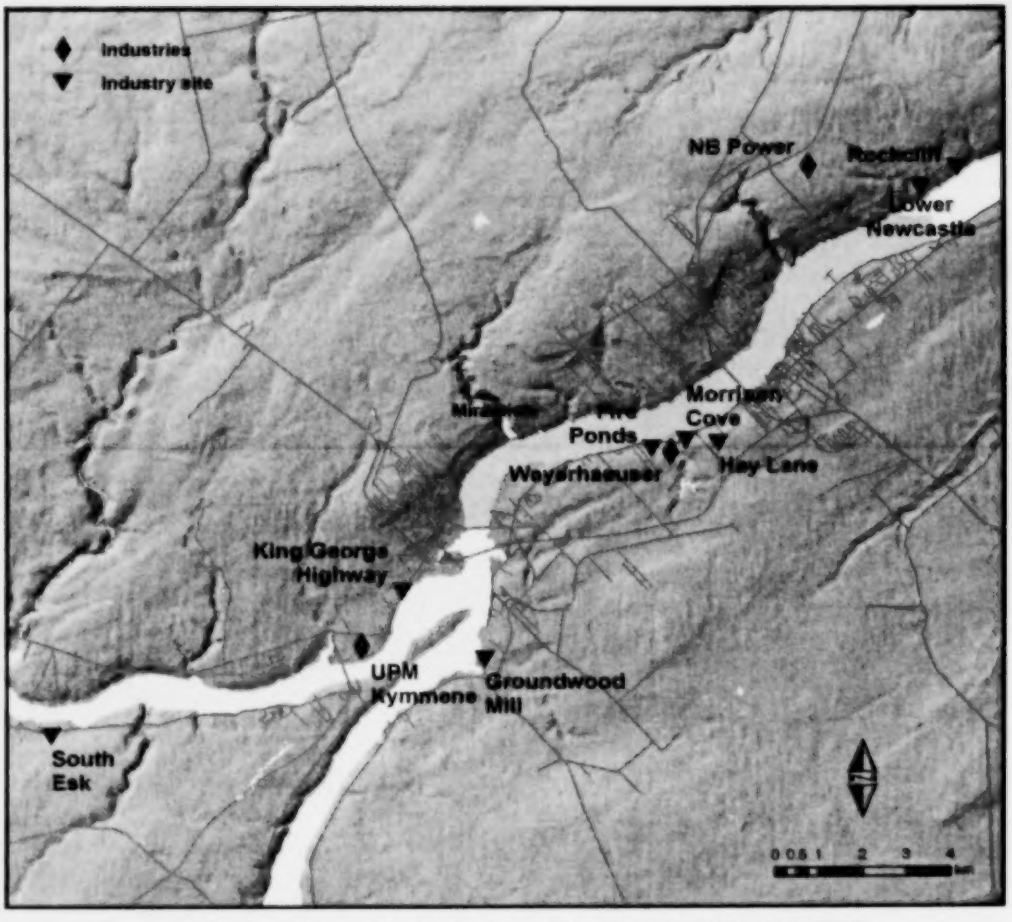
	Good (0-25)	Fair (26-50)	Poor (51-100)	Very Poor (over 100)
Forest Hills	98.9	0.7	0.4	0.0
Customs	99.5	0.5	0.0	0.0
Westside St.	98.8	1.2	0.0	0.0

B. MIRAMICHI

There are three monitoring sub-networks in the Miramichi region, one centred on the UPM pulp mill emission sources, another on NB Power's Millbank gas turbine generating site, and a third operated by the Weyerhaeuser Company.

Pollutants of concern in these networks include TRS and PM (UPM), NO_2 and SO_2 (Millbank) and PM (Weyerhaeuser).

Figure 4 shows the locations of the sites in the region.



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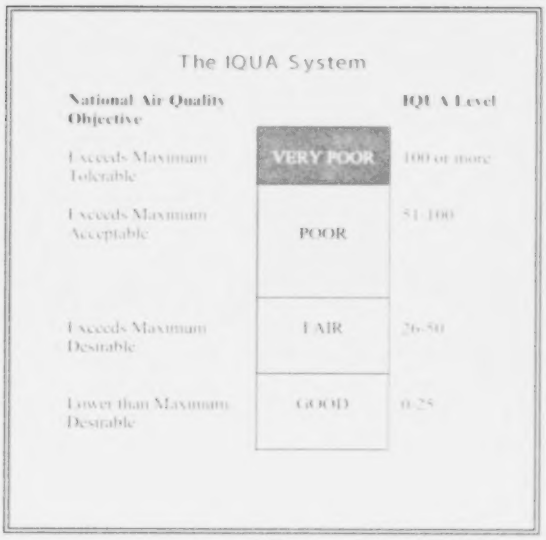

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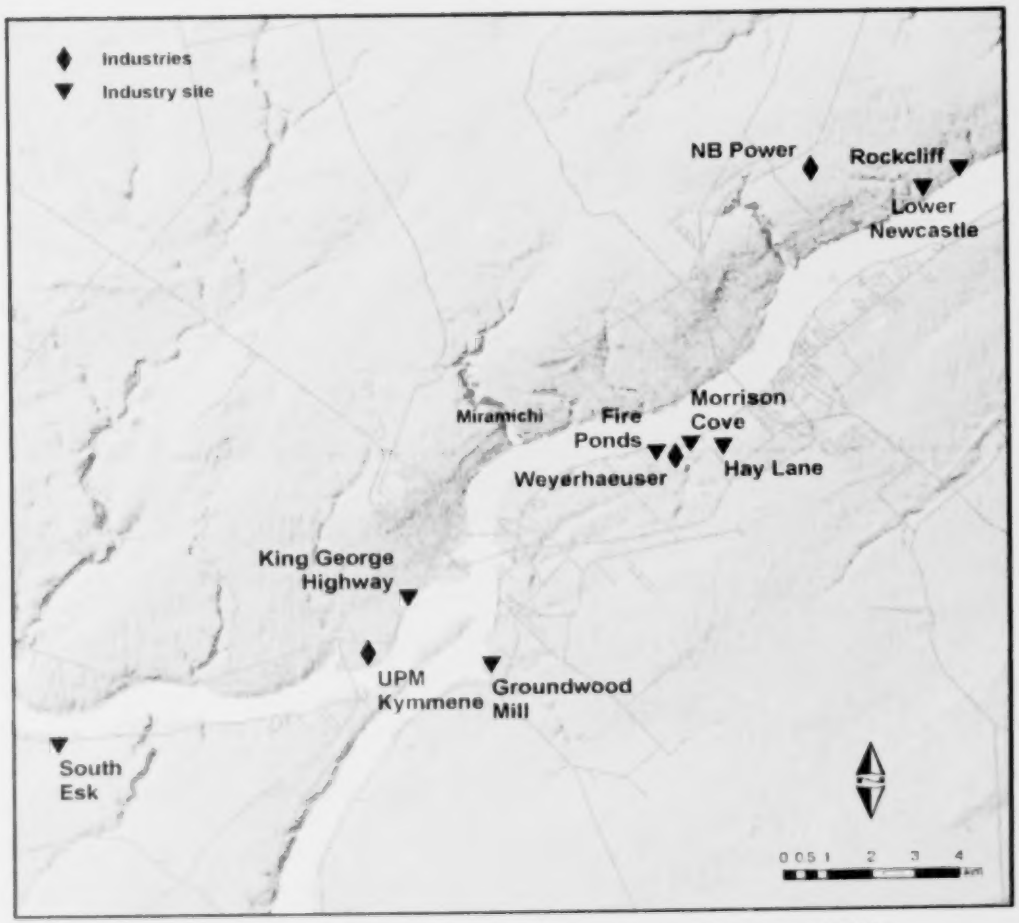


Figure 4. Air quality monitoring sites in the Miramichi Region, 2007.

B.1 UPM NETWORK

B.1.1 Total Reduced Sulphur

The compliance summary for 2007 is contained in Table 6, which also shows results for each year since 1998.

Note: for evaluation of TRS data, and in the absence of a specific objective for TRS, reference is made to the provincial objectives for hydrogen sulphide.

The large decrease in the number of exceedances at the King George Highway site in recent years is due to the shutdown of pulp production at the UPM mill in 2004, although kraft paper production continued until August 2007. There were no exceedances of 1-hour or 24-hour objectives at the Groundwood site during 2007.

B.1.2 Total Suspended Particulate

There were two exceedances of the TSP standard of 120 $\mu g/m^3$ at the King George Highway station during 2007. As the station is located along the busy King George Highway, it is not always clear whether elevated readings can be attributed to mill operations or to road dust from vehicle traffic. As an example, an exceedence was recorded in October 2007, when the mill had been shut down since August 2007. This would indicate the exceedence was due to road dust.

No exceedances were recorded at Groundwood and South Esk. Results since 1998 are shown in Table 7. Detailed results are shown in Appendix 1.

Table 6. Exceedances of provincial objectives for TRS (as H_2S) in Miramichi, 1998-2007.

		Groundwood	King George Hwy
2007	1-hour	0	1
2006	1-hour	0	1
2005	1-hour	4	3
2004	1-hour	0	142
2003	1-hour	2	56
2002	1-hour	0	23
2001	1-hour	1	90
2000	1-hour	0	598
1999	1-hour	5	488
1998	1-hour	9	410
2007	24-hour	0	16
2006	24-hour	163	23
2005	24-hour	0	61
2004	24-hour	74	1149
2003	24-hour	5	491
2002	24-hour	0	232
2001	24-hour	4	772
2000	24-hour	0	2219
1999	24-hour	9	2497
1998	24-hour	25	1636

Table 7. Exceedances of standards for TSP, Miramichi, 1998-2007.

		Groundwood	King George Hwy	South Esk
2007	24-hour	0	2	0
2006	24-hour	0	0	0
2005	24-hour	0	0	0
2004	24-hour	0	0	0
2003	24-hour	0	0	0
2002	24-hour	0	2	0
2001	24-hour	0	0	0
2000	24-hour	0	0	0
1999	24-hour	0	0	0
1998	24-hour	0	0	0

B.2 MILLBANK NETWORK

The two sites at Millbank (Rockcliff and Lower Newcastle, see Figure 4) are positioned to assess the impact of NB Power's gas turbine generating station. The pollutants monitored include SO_2, NO_2 and TSP (Rockcliff only). Since 1997, there have been no exceedances for SO_2, NO_2 or TSP logged in this network. Monthly results are shown in Appendix 1.

B.3 WEYERHAEUSER

B.3.1 Total Suspended Particulate

Weyerhaeuser operated a manufacturing plant for oriented strand board, on the south shore of the Miramichi River until January 2007, when it was shut down. TSP monitoring continued at Morrison Cove and Fire Ponds sites until May 30, 2007. The sampling schedule in 2007 was every sixth day.

During 2007, there were no exceedances of the 24-hour standard of 120 µg/m^3 at either of the stations (Table 8). The annual objective of 70 µg/m^3 was not exceeded at either site. Data are summarised in detail in Appendix 1.

B.3.2 Fine Particulate Matter

$PM_{2.5}$ was measured continuously at two sites, Fire Ponds and Hay Lane until March 2007 (Figure 4). Monitors at these sites use the beta attenuation method.

No exceedance of the daily average of 30 µg/m^3 occurred during 2007. Data are summarised in detail in Appendix 1.

Table 8. Exceedances of provincial objectives for TSP, Weyerhaeuser, Miramichi, 2000-2007.

		Mirview Subdiv.	Morrison Cove	Fire Ponds
2007	24-hour		0	0
2006	24-hour		0	1
2005	24-hour		0	1
2004	24-hour		0	0
2003	24-hour	closed	1	2
2002	24-hour	1	0	
2001	24-hour	0	1	
2000	24-hour	0	1	

C. GRAND LAKE - NB POWER

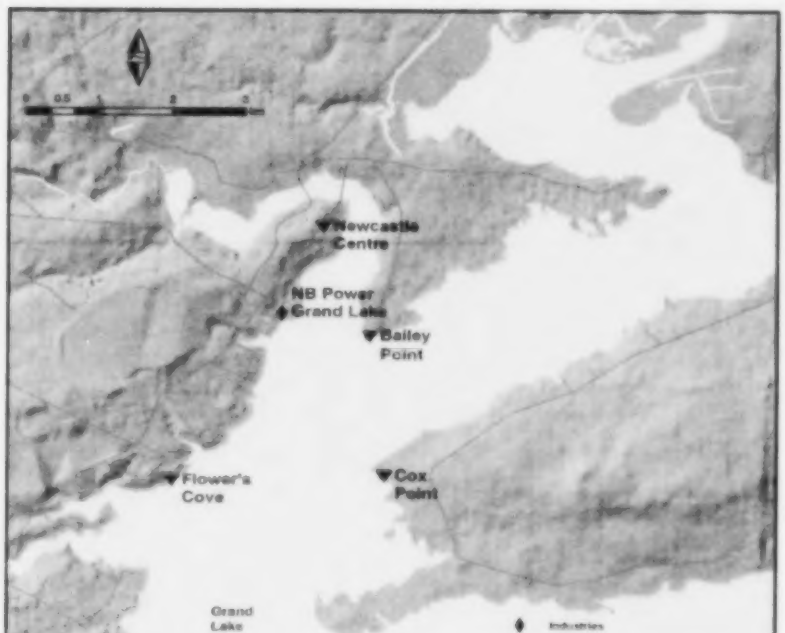
Figure 5 shows the locations of the four monitoring sites in this network. These are sited to monitor the effects of the Grand Lake coal-fired electrical generating station and associated activities. The four monitoring sites are operated by NB Power and each measures SO_2 and TSP.

C.1 Sulphur Dioxide

In 2007, two and four exceedances of the 1-hour standard of 340 ppb were recorded at Bailey Pt and Newcastle Centre, respectively. The 24-hour standard of 113 ppb was not exceeded at any site. Compliance statistics for SO_2 since 1998 are shown in Table 9.

C.2 Total Suspended Particulate

In 2007, there were no exceedances of the 24-hour standard of 120 $\mu g/m^3$ in this network. Complete results are given in Appendix 1. Compliance statistics for TSP since 1998 are shown in Table 10.



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2005	24-hour		0	1
2004	24-hour		0	0
2003	24-hour	closed	1	2
2002	24-hour	1	0	
2001	24-hour	0	1	
2000	24-hour	0	1	

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Table 9. Exceedances of provincial objectives for SO_2, NB Power Grand Lake Network, 1998-2007.

		Bailey Pt.	Cox Pt.	Flower's Cove	Newcastle Centre
2007	1-hour	2	0	0	4
2006	1-hour	0	0	0	0
2005	1-hour	0	0	0	1
2004	1-hour	1	0	1	6
2003	1-hour	1	0	2	5
2002	1-hour	0	0	3	3
2001	1-hour	0	2	0	0
2000	1-hour	0	0	0	2
1999	1-hour	0	0	0	4
1998	1-hour	0	1	0	5
2007	24-hour	0	0	0	0
2006	24-hour	0	0	0	0
2005	24-hour	0	0	0	0
2004	24-hour	0	0	0	0
2003	24-hour	0	0	0	0
2002	24-hour	0	0	0	0
2001	24-hour	0	0	0	0
2000	24-hour	0	0	0	0
1999	24-hour	0	0	0	0
1998	24-hour	0	0	0	0

Table 10. Exceedances of provincial objectives for TSP, NB Power Grand Lake Network, 1998-2007.

		Bailey Pt.	Cox Pt.	Flower's Cove	Newcastle Centre
2007	24-hour	0	0	0	0
2006	24-hour	0	0	0	0
2005	24-hour	0	0	0	0
2004	24-hour	0	0	0	0
2003	24-hour	0	0	0	0
2002	24-hour	0	0	0	0
2001	24-hour	0	0	0	0
2000	24-hour	0	0	0	0
1999	24-hour	0	0	1	0
1998	24-hour	0	0	0	0

D. LAKE UTOPIA PAPER (J.D. IRVING)

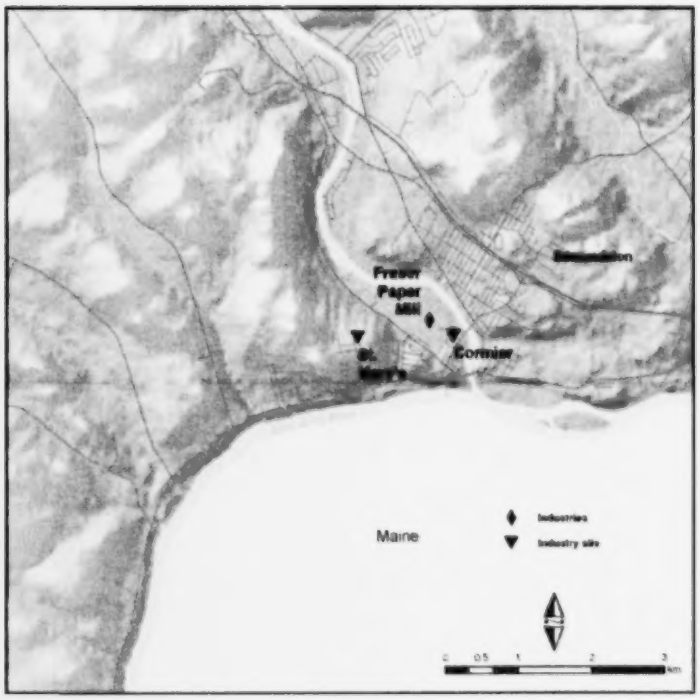
Monitoring for SO_2 at this site in Charlotte County commenced in January 2006. During 2007, there were three exceedances of the 1-hour objective (170 ppb) and 28 exceedances of the 24-hour objective (56 ppb) at the Utopia Irving Paper station (see Appendix 1). The exceedances occurred in February and April.

E. EDMUNDSTON – FRASER PAPERS INC.

Figure 6 shows the locations of the monitoring sites, located primarily to monitor the impacts of the Fraser Papers Inc. pulp mill.

E.1 Sulphur Dioxide

There were no exceedances of SO_2 objectives in this network during 2007. Compliance statistics for SO_2 since 1998 are shown in Table 11.



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2006	1-hour	0	0	0	0
2005	1-hour	0	0	0	1
2004	1-hour	1	0	1	6
2003	1-hour	1	0	2	5
2002	1-hour	0	0	3	3
2001	1-hour	0	2	0	0
2000	1-hour	0	0	0	2
1999	1-hour	0	0	0	4
1998	1-hour	0	1	0	5
2007	24-hour	0	0	0	0
2006	24-hour	0	0	0	0
2005	24-hour	0	0	0	0
2004	24-hour	0	0	0	0
2003	24-hour	0	0	0	0
2002	24-hour	0	0	0	0
2001	24-hour	0	0	0	0
2000	24-hour	0	0	0	0
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1998	24-hour	0	0	0	0

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2007	24-hour	0	0	0	0
2006	24-hour	0	0	0	0
2005	24-hour	0	0	0	0
2004	24-hour	0	0	0	0
2003	24-hour	0	0	0	0
2002	24-hour	0	0	0	0
2001	24-hour	0	0	0	0
2000	24-hour	0	0	0	0
1999	24-hour	0	0	1	0
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		Cormier School	St. Mary
2007	1-hour	0	0
2006	1-hour	0	0
2005	1-hour	0	0
2004	1-hour	0	0
2003	1-hour	0	0
2002	1-hour	0	0
2007	24-hour	0	0
2006	24-hour	0	0
2005	24-hour	0	0
2004	24-hour	0	0
2003	24-hour	0	0
2002	24-hour	40	0

E.2 $PM_{2.5}$

Continuous fine particulate measurements (TEOM) began at the Cormier site in June 2000.

In 2007, one day had a daily average exceeding 30 µg/m³ in May. Statistics are shown in Table 12 and additional results are shown in Appendix 1.

Table 12. Monitoring results for $PM_{2.5}$, Fraser Papers Inc., Edmunston, 2007.

	Cormier
Annual average (µg/m³)	7.3
98th percentile value (CWS)	19.0
Days with daily average >30 µg/m³	1
Hours with running 24-hour average >30 µg/m³	36

F. BELLEDUNE

There are a number of monitoring sites in the Belledune region. Three of these are located for the assessment of emissions from the Xstrata complex, formerly Noranda Inc. Brunswick Smelter. A further five monitors are operated for the assessment of NB Power's coal-fired electrical generating station.

Figure 7 shows the locations of all the monitoring sites in the region.

F.1 Xstrata

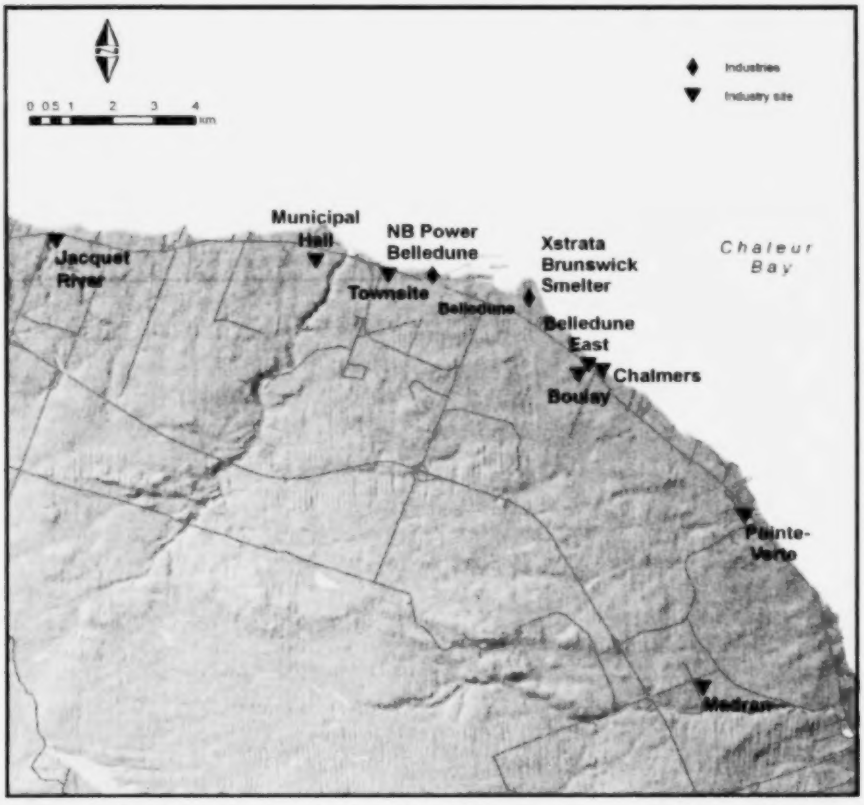
All sites in the Xstrata network monitor SO_2 and TSP.

F.1.1 Sulphur Dioxide

In 2007, there was no exceedance of the 1-hour objective at the Boulay, Townsite and Chalmers sites. Compliance statistics for SO_2 since 1998 are shown in Table 13.

F.1.2 Total Suspended Particulate

In 2007, there were no exceedances. Compliance statistics for TSP since 1998 are shown in Table 14.



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2007	24-hour	0	0
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2003	24-hour	0	0
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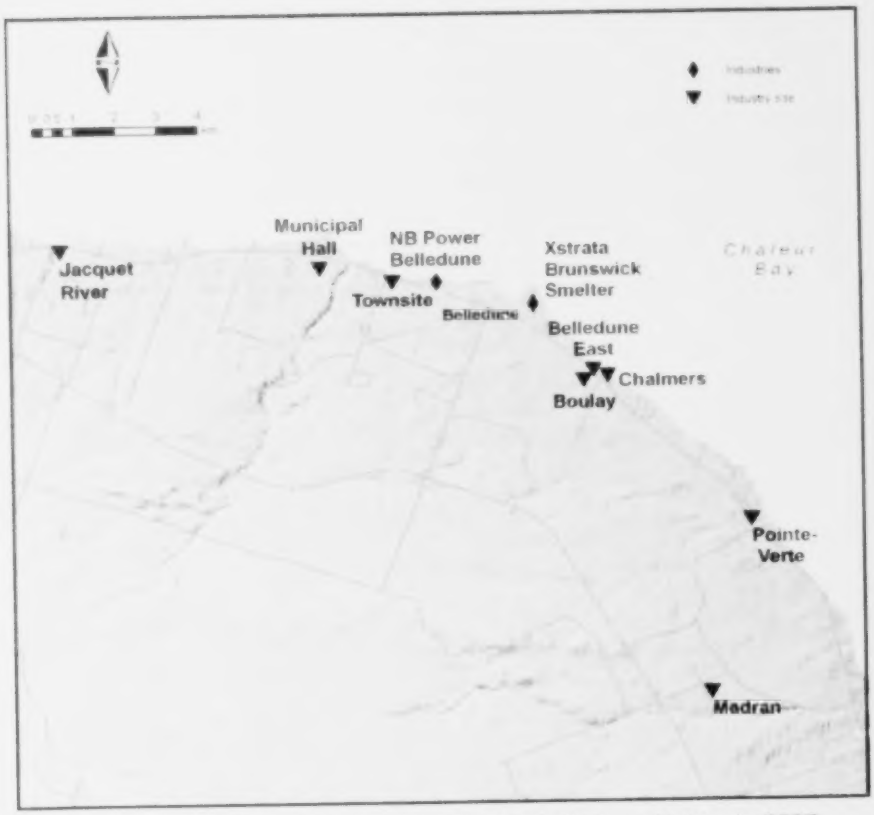

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Table 13. Exceedances of provincial objectives for SO_2, Xstrata, 1998-2007.

Year	Objective	Boulay	Chalmers	Townsite
2007	1-hour	0	0	0
2006	1-hour	1	0	1
2005	1-hour	0	1	1
2004	1-hour	0	0	0
2003	1-hour			
2002	1-hour	1	3	0
2001	1-hour	4	2	0
2000	1-hour	2	1	1
1999	1-hour	1	1	1
1998	1-hour	4	7	2
2007	24-hour	0	0	0
2006	24-hour	0	0	0
2005	24-hour	0	0	0
2004	24-hour	0	0	0
2003	24-hour			
2002	24-hour	0	0	0
2001	24-hour	0	0	0
2000	24-hour	0	0	0
1999	24-hour	0	0	0
1998	24-hour	0	0	0

Note: In 2003, data were available only for the period January-June

Table 14. Exceedances of provincial objectives for TSP, Xstrata, 1998-2007.

Year	Objective	Boulay	Chalmers	Townsite
2007	24-hour	0	0	0
2006	24-hour	0	0	0
2005	24-hour	0	0	0
2004	24-hour	0	0	0
2003	24-hour			
2002	24-hour		0	0
2001	24-hour		0	0
2000	24-hour		0	1
1999	24-hour		0	0
1998	24-hour		0	0

F.2 NB POWER

There are five sites in this network (see Table 15), all of which monitor SO_2. Belledune East and Municipal Hall also monitor NO_2.

F.2.1 Sulphur Dioxide

During 2007, there was no exceedance of SO_2 at any site in the Belledune network. Compliance statistics for SO_2 since 1998 are shown in Table 15.

F.2.2 Nitrogen Dioxide

This contaminant is measured at Belledune East and Municipal Hall. There were no exceedances of the applicable 1 or 24-hour objectives in 2007 at either location. There have been no exceedances of NO_2 recorded in this network since 1998.

Table 15. Exceedances of provincial objectives for SO_2, NB Power Belledune Network, 1998-2007.

Year	Objective	Belledune East	Jacquet River	Madran	Municipal Hall	Pointe Verte
2007	1-hour	0	0	0	0	0
2006	1-hour	1	0	0	1	0
2005	1-hour	0	3	0	0	0
2004	1-hour	0	0	0	0	0
2003	1-hour	3	0	0	1	0
2002	1-hour	4	0	0	0	1
2001	1-hour	2	0	0	1	0
2000	1-hour	2	0	0	1	0
1999	1-hour	1	0	0	0	0
1998	1-hour	4	0	0	0	0
2007	24-hour	0	0	0	0	0
2006	24-hour	0	0	0	0	0
2005	24-hour	0	0	0	0	0
2004	24-hour	0	0	0	0	0
2003	24-hour	0	0	0	0	0
2002	24-hour	0	0	0	0	0
2001	24-hour	0	0	0	0	0
2000	24-hour	0	0	0	0	0
1999	24-hour	0	0	0	0	0
1998	24-hour	0	0	0	0	0

G. DALHOUSIE – NB Power

Figure 8 shows the locations of the sites in the Dalhousie region. The sites in this region are operated to monitor the effects of the NB Power Dalhousie electrical generating station. Six sites measure SO_2. One of these sites also monitors TSP, and there is one additional TSP site (7 sites in all). Because of potential pollution transport across the Bay of Chaleur, one of the stations is located in the province of Québec.

G.1 Sulphur Dioxide

Compliance with the applicable 1-hour, 24-hour and annual objectives was 100% at all sites in 2007. Detailed summaries are given in Appendix 1. There have been no exceedances of SO_2 recorded in this network since 1998.

G.2 Total Suspended Particulate

TSP was measured at the Coal Berm and Dalhousie Tower sites. Results are shown in Appendix 1. None of the individual readings obtained was above the 24-hour objective of 120 $\mu g/m^3$ in 2007, and the annual geometric means were also below 10 $\mu g/m^3$ (the standard is 70 $\mu g/m^3$). There have been no exceedances of TSP recorded in this network since 1998.

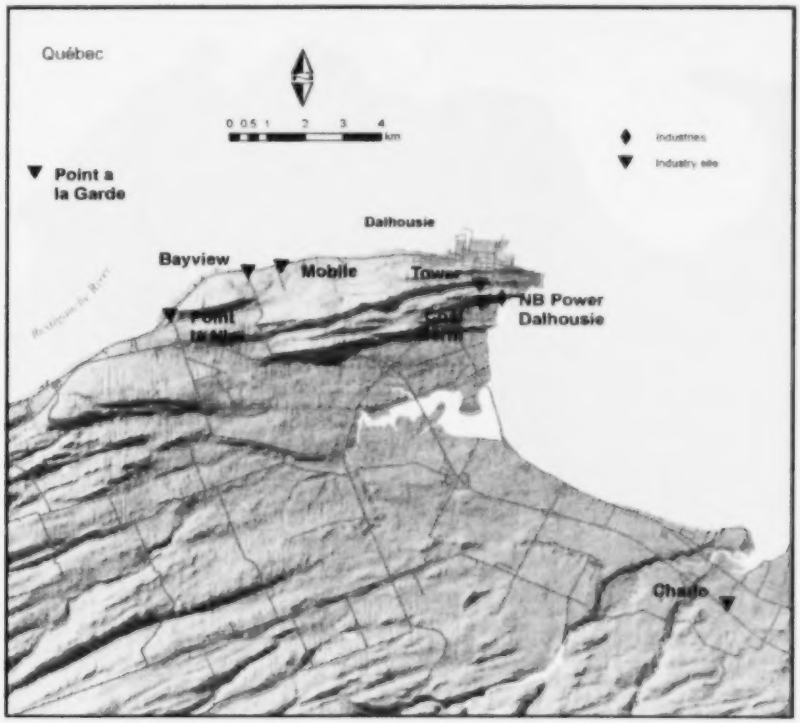

Figure 8. Air quality monitoring sites in the Dalhousie Network, 2007.

H. ATHOLVILLE - AV CELL INC.

H.1 Sulphur Dioxide

AV Cell Inc. operates a pulp mill in Atholville, and maintains two associated ambient air monitoring sites, Boom Road (to the west of the mill) and Beauvista (east). Sulphur dioxide is measured at both sites.

Compliance during 2007 was 100% with no exceedances of the 1-hour objective (340 ppb), 24-hour objective (113 ppb) or the annual objective (23 ppb) at either site. Compliance statistics for SO_2 since 1999 are shown in Table 16.

Table 16. Exceedances of provincial objectives for SO_2, AV Cell Network, 1999-2007.

Year	Objective	Boom Rd (W)	Beauvista (E)
2007	1-hour	0	0
2006	1-hour	0	0
2005	1-hour	0	0
2004	1-hour	0	0
2003	1-hour	0	0
2002	1-hour	0	0
2001	1-hour	0	0
2000	1-hour	1	0
1999	1-hour	0	3
2007	24-hour	0	0
2006	24-hour	0	0
2005	24-hour	0	0
2004	24-hour	0	0
2003	24-hour	0	0
2002	24-hour	0	0
2001	24-hour	0	0
2000	24-hour	0	0
1999	24-hour	0	0

H.2 Nitrogen Dioxide

As follow-up to a dispersion modeling exercise, AV Cell Inc. was requested by DENV to monitor levels of nitrogen dioxide. Monitoring was split between two sites, Boom Road and Beauvista monitoring stations, beginning in December 2006 and continuing until August 2008.

No exceedances of the 1-hour air quality objective of 210 ppb or the 24-hour objective of 105 ppb for NO_2 were recorded. At Beauvista the average value while monitoring at that site was 5 ppb with maximum 1-hour and 24-hour values of 40 and 24 ppb, respectively. At the Boom Road site the average value was 8 ppb with maximum 1-hour and 24-hour values of 35 and 26 ppb, respectively.

I. BATHURST

I.1 Ground Level Ozone

There were no exceedances of the national 1-hour objective for ozone during 2007.

I.2 $PM_{2.5}$

Concentrations were low throughout the year. Results are summarised in Table 17.

During 2007, this station changed from TEOM to BAM technology. Complete results are shown in Appendix 1.

Table 17. Monitoring results for $PM_{2.5}$, Bathurst, 2007.

	Rough Waters Drive (TEOM and BAM)
Annual average (µg/m³)	4.9
98th percentile value (CWS)	12.9
Days with daily average >30 µg/m³	0
Hours with running 24-hour average >30 µg/m³	0

G. DALHOUSIE – NB Power

Figure 8 shows the locations of the sites in the Dalhousie region. The sites in this region are operated to monitor the effects of the NB Power Dalhousie electrical generating station. Six sites measure SO_2. One of these sites also monitors TSP, and there is one additional TSP site (7 sites in all). Because of potential pollution transport across the Bay of Chaleur, one of the stations is located in the province of Québec.

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Compliance with the applicable 1-hour, 24-hour and annual objectives was 100% at all sites in 2007. Detailed summaries are given in Appendix 1. There have been no exceedances of SO_2 recorded in this network since 1998.

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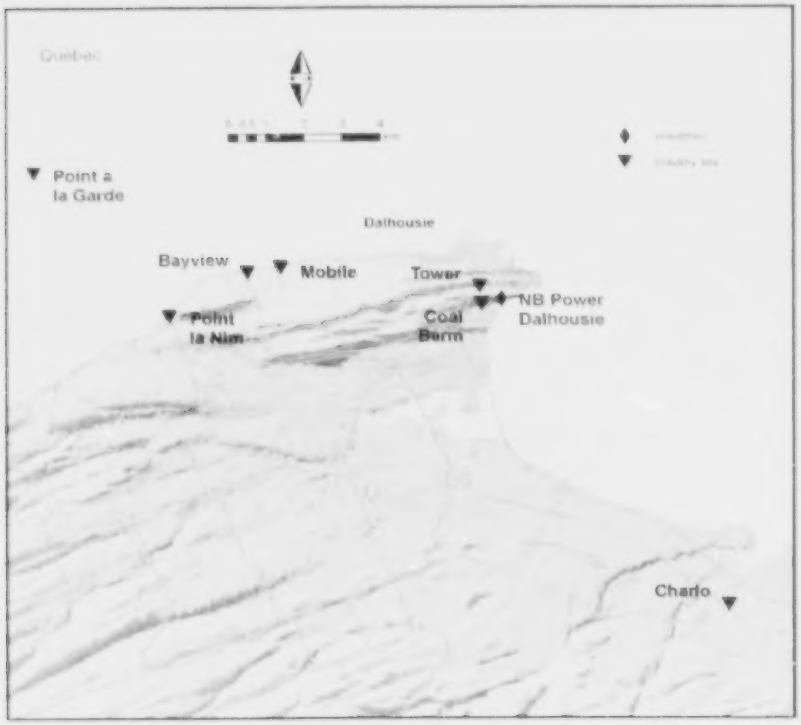

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2007	1-hour	0	0
2006	1-hour	0	0
2005	1-hour	0	0
2004	1-hour	0	0
2003	1-hour	0	0
2002	1-hour	0	0
2001	1-hour	0	0
2000	1-hour	1	0
1999	1-hour	0	3
2007	24-hour	0	0
2006	24-hour	0	0
2005	24-hour	0	0
2004	24-hour	0	0
2003	24-hour	0	0
2002	24-hour	0	0
2001	24-hour	0	0
2000	24-hour	0	0
1999	24-hour	0	0

H.2 Nitrogen Dioxide

As follow-up to a dispersion modeling exercise, AV Cell Inc. was requested by DENV to monitor levels of nitrogen dioxide. Monitoring was split between two sites, Boom Road and Beauvista monitoring stations, beginning in December 2006 and continuing until August 2008.

No exceedances of the 1-hour air quality objective of 210 ppb or the 24-hour objective of 105 ppb for NO_2 were recorded. At Beauvista the average value while monitoring at that site was 5 ppb with maximum 1-hour and 24-hour values of 40 and 24 ppb, respectively. At the Boom Road site the average value was 8 ppb with maximum 1-hour and 24-hour values of 35 and 26 ppb, respectively.

I. BATHURST

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	Rough Waters Drive (TEOM and BAM)
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98th percentile value (CWS)	12.9
Days with daily average >30 µg/m^3	0
Hours with running 24-hour average >30 µg/m^3	0

J. FREDERICTON

The Fredericton site is on Aberdeen Street, in an area representative of the "downtown" residential and business district. This site is also considered representative of a wider area for pollutants, such as ozone, which are regional in nature.

J.1 Carbon Monoxide

No exceedances of the 1-hour or 8-hour objectives (30 ppm and 13 ppm respectively) were recorded. Peak values tend to be higher in the colder months than during the summer. There have been no exceedances of CO at this site since it was established in 1999.

J.2 Nitrogen Dioxide

No exceedances of the 1-hour or 24-hour objectives (210 ppb and 105 ppb respectively) were recorded. As with carbon monoxide, higher readings are usually recorded in the colder months. There have been no exceedances of NO_2 at this site since it was established in 1999.

J.3 Ground Level Ozone

There were no exceedances of the national 1-hour objective for ozone during 2007. There is additional discussion of data from the ozone network in section 8.

J.4 $PM_{2.5}$

Fine particulate matter ($PM_{2.5}$) was measured at the Aberdeen Street site. Data obtained during 2007 indicated generally moderate to low particulate concentrations. Data are summarised in Table 18.

J.5 Index of the Quality of the Air

Results for 2007 showed air quality in the "good" category for 97.9% of the time, with 2.1% in the "fair" range. Ozone was responsible for the small number of hours in the fair range. Results were made available hourly via recorded voice message at (506) 451-6000.

Table 18. Monitoring results for $PM_{2.5}$, Fredericton, 2007.

	Aberdeen St. (BAM)
Annual average (µg/m³)	3.8
98th percentile value (CWS)	16.8
Days with daily average >30 µg/m³	0
Hours with running 24-hour average >30 µg/m³	0

K. NACKAWIC

The former Ste. Anne Nackawic Kraft Mill closed its doors in September 2004 and was reopened under new ownership as AV Nackawic Inc. in January 2006. Sulphur dioxide, total reduced sulphur and total suspended particulate as well as wind speed and direction are measured at the Caverhill Road site.

During 2007, there was one exceedance of the 1-hour TRS objective detected at the Caverhill Road site and there were 181 exceedances of the 24-hour objective. Because of the large number of exceedances, DENV issued AV Nackawic Inc. a Warning Letter under the Department's Compliance & Enforcement Policy in September 2007. A Schedule of Compliance was requested to address the high TRS readings. Several actions were identified and implemented, including increased aeration in the aerated lagoon system to ensure that anaerobic conditions do not occur, improved control of contaminated condensate conductivity to minimize TRS generation at the brown stock washer vents and increased maintenance and repair of valves and vents thus minimizing fugitive emissions from these sources.

The compliance history for TRS since 1999 is shown in Table 19. In regards to SO_2 and TSP, no exceedances were recorded at this site during 2007.

Table 19. Exceedances of provincial objectives for TRS (as H_2S), Nackawic Network, 2007.

Year	Objective	Caverhill Road
2007	1-hour	1
2006	1-hour	1
2005	1-hour	M
2004	1-hour	6
2003	1-hour	1
2002	1-hour	6
2001	1-hour	0
2000	1-hour	6
1999	1-hour	4
2007	24-hour	181
2006	24-hour	0
2005	24-hour	M
2004	24-hour	19
2003	24-hour	0
2002	24-hour	0
2001	24-hour	0
2000	24-hour	0
1999	24-hour	33

Note: results for 2004 based on 8 months of operation. The Nackawic mill was shut down in September 2004 and was reopened under new ownership in January 2006.
M= missing data.

L. MONCTON

The Moncton air quality monitoring site is situated at the Highfield Street water pumping station. The site location was chosen to provide readings representative of the central city. In addition, this site is influenced by emissions from vehicles or institutional heating systems, as well as regional pollutants such as ozone.

L.1 Carbon Monoxide

No exceedances of hourly or 8-hourly objectives for carbon monoxide occurred during 2007. Readings were similar to those recorded in downtown Saint John and Fredericton, remaining well below objectives. No exceedances of CO objectives have been recorded since monitoring began in 1998.

L.2 Nitrogen Dioxide

No exceedances of hourly or 24-hour standards for nitrogen dioxide were recorded during 2007. No exceedances of NO_2 objectives have been recorded since monitoring began in 1998.

L.3 Ground Level Ozone

There were no exceedances of the hourly objective for ozone (82 ppb). More discussion of ozone data may be found in the section on long term trends.

L.4 $PM_{2.5}$

In 2007, the maximum 24-hour value was 29 $\mu g/m^3$. Data are summarized in Table 20. During 2007, this site changed from TEOM to BAM technology. Complete results are shown in Appendix 1.

L.5 Index of the Quality of the Air

Hourly IQUA reports are generated for the Moncton site and made available via recorded message at (506) 851-6610. Summary statistics for 2007 indicated that good air quality was recorded for 99.7% of all hours, and fair for 0.3%.

Table 20. Monitoring results for $PM_{2.5}$, Moncton (BAM/TEOM), 2007.

	Highfield St. (TEOM and BAM)
Annual average (µg/m³)	5.3
98th percentile value (CWS)	19.0
Days with daily average >30 µg/m³	0
Hours with running 24-hour average >30 µg/m³	0

M. ST. ANDREWS

The St. Andrews monitoring station is located on the grounds of the Huntsman Marine Science Centre (H.M.S.C.) and is operated with the support of staff from the Centre and DENV. This site has been used for a variety of special sampling projects and is especially suitable for investigating trans-boundary air pollution. Currently, projects operated at St. Andrews by the province include ozone and $PM_{2.5}$ monitoring. Additionally, Environment Canada was measuring mercury concentration in air until it was concluded in July 2007. Results from this site are compared with another site in the region at Kejimkujik, NS.

M.1 $PM_{2.5}$

In general, readings were very low at this site. Data are summarized in Table 21. During 2007, this site changed from TEOM to BAM technology. Complete results are shown in Appendix 1.

M.2 Mercury Monitoring

Mercury is of concern as an environmental contaminant because of its ability to accumulate in living organisms, potentially reaching concentrations which could pose a hazard to health in humans and wildlife (e.g. NESCAUM, 1998). Although mercury has been recognised as an environmental pollutant for decades, relatively little monitoring and assessment of the transport and behaviour of mercury in the atmosphere has taken place. Most attention has been paid to direct discharges, for example of industrial, water-borne effluents. In 1998, the New England Governors and Eastern Canadian Premiers identified mercury as a substance of concern in eastern Canada and the United States, and developed an Action Plan to improve our understanding of its impacts, and also proposed measures to reduce man-made emissions (NEGECP, 1998). Since that time, Canada-wide Standards for mercury emissions have been adopted in Canada.

Table 21. Monitoring results for $PM_{2.5}$, St Andrews, 2007.

	H.M.S.C. (TEOM and BAM)
Annual average (µg/m³)	3.5
98th percentile value (CWS)	14.9
Days with daily average >30 µg/m³	0
Hours with running 24-hour average >30 µg/m³	0

Mercury monitoring conducted at St. Andrews contributes to the scientific understanding of mercury in the environment. The results are used in research (for example, into atmospheric processes) as well as in wildlife and other studies.

Table 22 summarises results of the mercury monitoring program. These monitoring studies are operated cooperatively between Environment Canada, the Huntsman Marine Science Centre, and DENV. Monitoring for mercury in precipitation at St. Andrews ended in 2004 and measuring of mercury in air was continued at this site by Environment Canada until July 2007. Environment Canada will continue mercury monitoring in air at Kejimkujik National Park in Nova Scotia.

There are no environmental guidelines or objectives for mercury in air or precipitation at present. The data may be used to look for patterns or trends over time, and to compare regionally with other locations. They are also used as input to ecological models which attempt to track how mercury moves though different components of the environment.

Table 22. Mercury monitoring results, 1995-2007.

Ambient Air

St Andrews		Other sites	
Year	Annual Average (ng/ cubic metre)	Site	Annual averages (ng/cubic metre)
1995	1.9	Kejimkujik, NS	1.2 (2007)[1]
1996	1.5		
1997	1.4		
1998	1.4		
1999	1.6		
2000	1.4		
2001	1.4		
2002	(1.2)*		
2003	1.5**		
2004	1.3		
2005	Unavailable		
2006	1.2		
2007	1.3***		

Precipitation (rain and snow)*

Year	Total mercury concentration (ng/L)	Kejimkujik, N.S.	Total mercury concentration (ng/L) [2]
1998	6.5	1998	5.3
1999	6.7	1999	4.9
2000	6.7	2000	5.4
2001	7.2	2001	6.6
2002	5.0	2002	5.4
2003	5.6	2003	5.0
2004	closed	2004	5.2
		2005	4.4
		2006	5.4
		2007	5.6

Notes:
ng = nanograms. 1 nanogram is one thousand-millionth of a gram. Ambient air mercury data supplied by Environment Canada.

* In 2002, sampler operated only January-July.
** In 2003, sampler operated May-December
*** In 2007, sampler operated January-July

References:

[1] Environment Canada
[2] NADP


Bathurst
St.
Leonard
Lower
New
Moncton
Canterbury
Fredericton
Fundy
National
Park
Blissville
Norton
Saint
John
St.
Andrews

On a regional scale, mercury levels in air are comparable between St. Andrews and Kejimkujik. To the end of July 2007, the average value at St. Andrews in 2007 was 1.3 ng/m^3 and at Kejumkujik the annual average was 1.2 ng/m^3.

4. RURAL OZONE NETWORK

Figure 9 shows the locations of the sites which monitor ground level ozone in New Brunswick. This network is operated to assess the impact of long-range transport. It focuses on the southern portion of the province, which is the region most affected by long range transport, as shown by special short-term monitoring studies and trajectory analyses (e.g. Fuentes and Dann, 1994; Tordon et al., 1994; Multistakeholder NOx/ VOC Science Program, 1997a, 1997b). Ozone monitoring at the Bathurst site commenced in May 2006.

The 1-hour objective of 82 ppb was exceeded at the Fundy Park and Norton stations. Two exceedances occurred at the elevated monitoring site in Fundy Park and two at Norton during the same time on August 3rd, 2007. Results are summarised in Table 23. Monthly means and extremes for each site are shown in Appendix 1.

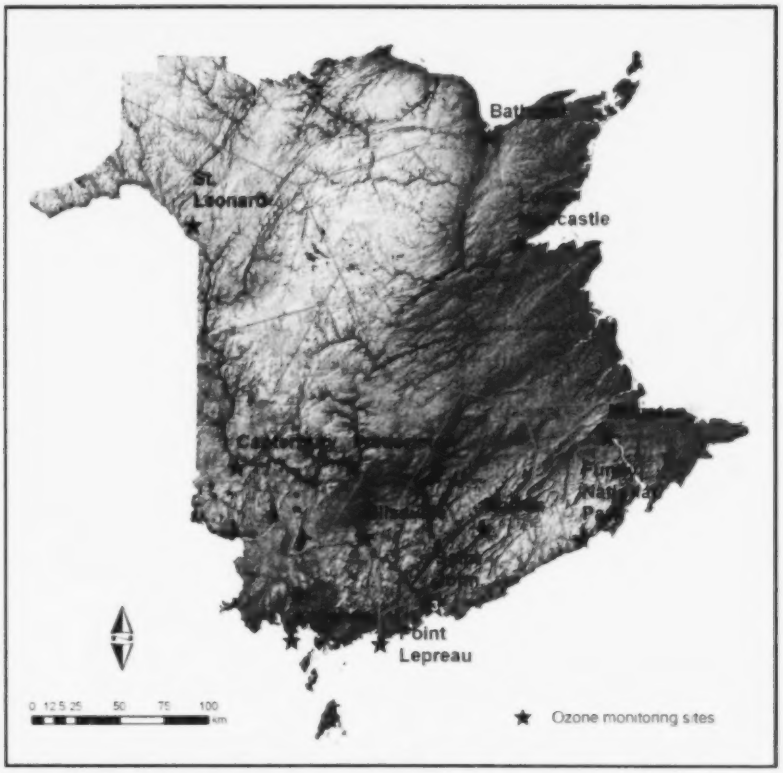


Figure 9. Locations of ozone monitoring sites in New Brunswick, 2007.

A. Air quality Advisories

DENV works with Environment Canada and the Department of Health and Wellness in the preparation and dissemination of daily forecasts of ozone. DENV maintains the monitoring network and supplies real-time data to Environment Canada forecasters, who issue twice-daily forecasts of ozone concentrations. When forecast data indicate that the 1-hour Air Quality Objective for ozone will be exceeded or closely approached, air quality and health advisories are issued to the media to provide advance notice to the public. Advisories may be issued for specific regions of the province.

In recent years, air quality advisories may also be issued when levels of fine particulate ($PM_{2.5}$) are expected to rise above 30 $\mu g/m^3$ for an extended period. For example, when smoke from forest fire within the region are forecasted to affect air quality in New Brunswick.

There were no smog advisories issued by Environment Canada in 2007.

Table 23. Exceedances of the 1-hour ozone objective (number of hours),

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Blissville													0
Canterbury													0
Customs													0
Forest Hills													0
Fredericton													0
Fundy Park								2					2
Hillcrest													0
Lower Newcastle													0
Mobile (Saint John)	-	-	-	-	-	-	-	-	-	-	-	-	--
Moncton													0
Norton								2					2
Pt. Lepreau													0
St. Andrews													0
St Leonard													0
Total	0	0	0	0	0	0	0	4	0	0	0	0	4

The 1- hour National Objective is 82 ppb.

-- = missing data.

5. CANADA-WIDE STANDARDS (CWS)

A. Canada-wide Standard for Ozone

Figures 10 and 11 show Canada-wide Standard values for 2007 and the previous seven years. Each plotted point is calculated as the average of three years ending at that time, i.e. the point for 2007 is the average for the years 2005-2007. The CWS for ozone is 65 ppb. Figure 10 shows results for urban stations and results for rural sites are shown in Figure 11. In recent years, all sites, with the exception of Fundy Park, remain below the CWS criterion. At Fundy Park, the 3 year average CWS value was 65 ppb in 2007.

The compliance date for the Canada-wide Standards for ozone and $PM_{2.5}$ is 2010.

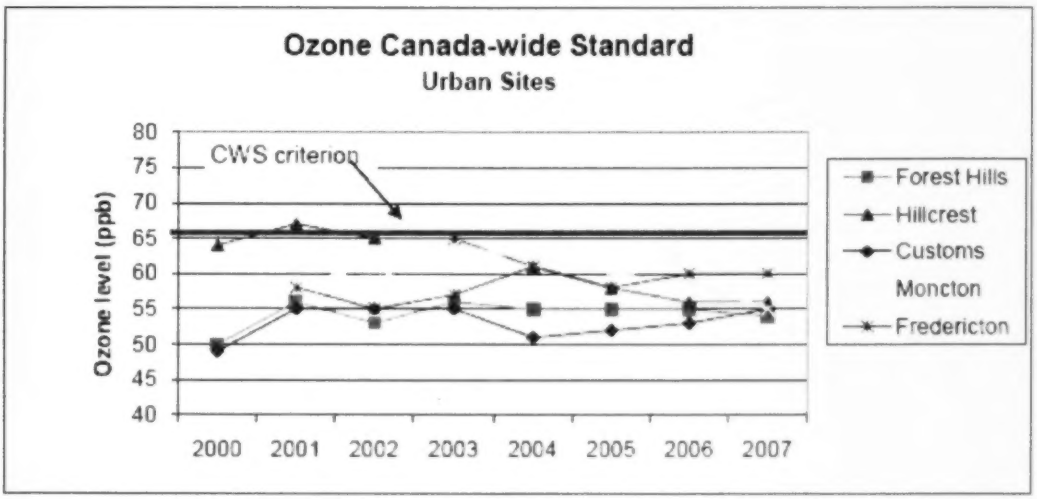


Figure 10. Canada-wide Standard results for ozone at urban sites, 2000-2007.

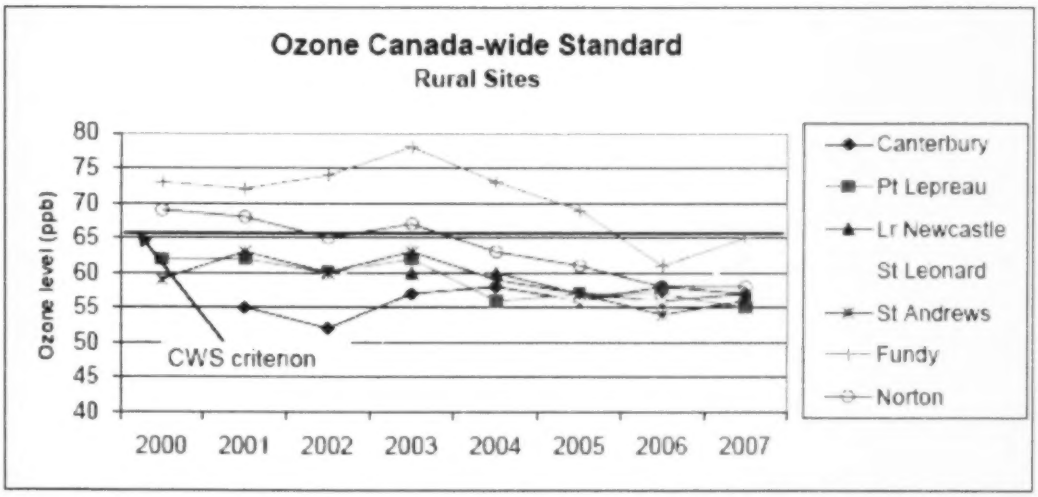


Figure 11. Canada-wide Standard results for ozone at rural sites, 2000-2007.

B. Canada-wide Standard for $PM_{2.5}$

Figures 12 and 13 show CWS results for $PM_{2.5}$. Figure 12 shows results for various sites in New Brunswick and Figure 13 shows results for stations in Saint John. The CWS for $PM_{2.5}$ is 30 µg/m³. As with the ozone CWS charts, each plotted point is a three-year average. The period of record varies between sites. Results at all stations have remained below the CWS standard to date, and have fallen since 2003.

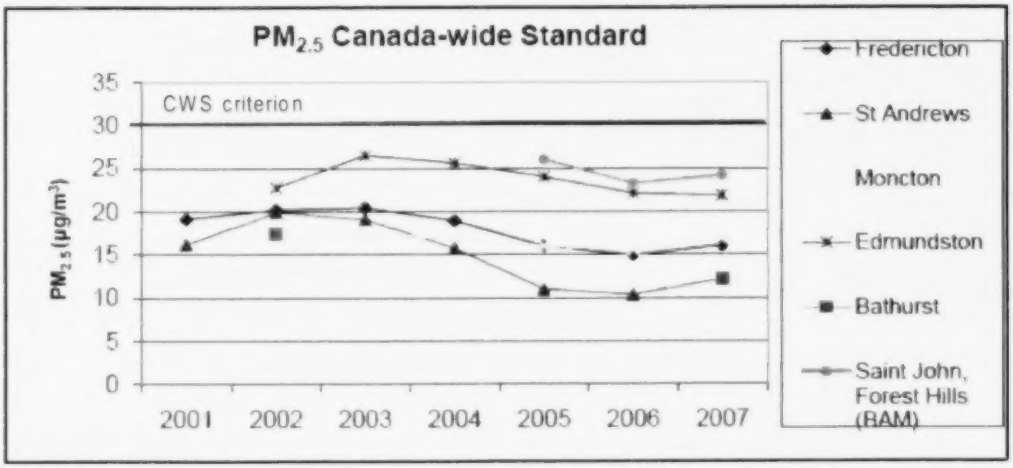


Figure 12. Canada-wide Standard results for $PM_{2.5}$, 2001-2007.

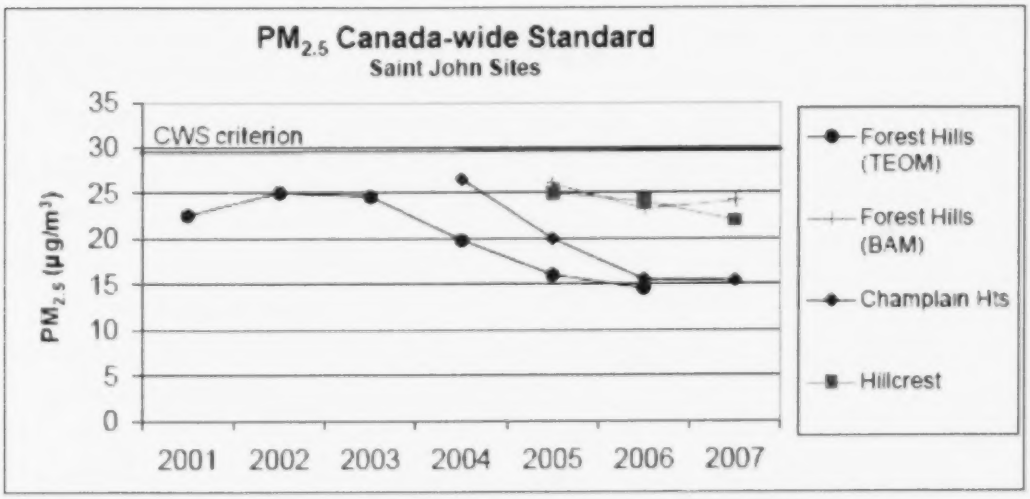


Figure 13. Canada-wide Standard results for $PM_{2.5}$ Saint John sites, 2001-2007


Nictau
Trout Brook
Holtville
Harcourt
Coles Island
Saulerbury
South Oromocto Lake
Fundy National Park
Pennfield

6. ACID PRECIPITATION NETWORK

Emissions of sulphur dioxide and nitrogen oxides can be transformed in the atmosphere to acidic particles which ultimately fallout as acid deposition, in both wet and dry form. Acid precipitation, or acid rain, refers to the wet form of acid deposition.

The potentially adverse impacts of acid precipitation have been recognized since the early 1980's. Acid precipitation effects occur at a broad regional level, not just close to the sources of the contaminants themselves. The emissions which cause acid precipitation typically travel long distances, hundreds or even thousands of kilometers, before returning to the surface in rain or snow. In New Brunswick, acid deposition is affected by local emissions and the emissions from several large industrial regions which are located upwind, including the American Midwest, southern Ontario and Québec, and the Washington-Boston region. The same emissions also contribute to regional haze and fine particulate pollution.

Consequently, measures to reduce emissions that contribute to acid rain have been underway in North America since the late 1980's. Over the past two decades sulphur dioxide emissions from major sources within New Brunswick have been reduced significantly including new commitments to reduce emissions under the Canada-wide Acid Rain Strategy for Post-2000.

New Brunswick has operated an extensive acid precipitation (rain and snow) monitoring network since the early 1980s. Since 1987, this has been a partnership effort with logistical and financial support from NB Power. In 2007 there were 13 acid precipitation monitoring stations in operation, which are predominantly located in remote rural areas. Figure 14 shows the location of the acid precipitation monitoring sites in New Brunswick. In 2007, two of the DENV sites were moved (Nictau and Canterbury) a short distance to accomodate

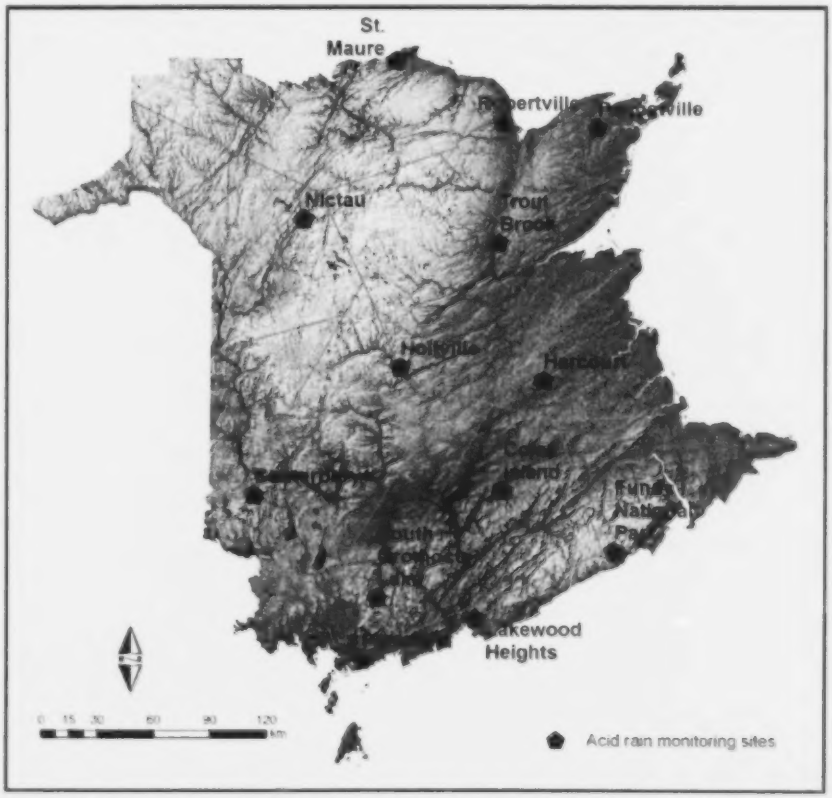


Figure 14. Location of acid rain monitoring sites in New Brunswick, 2007.

new site operators. All precipitation samples are analyzed at the DENV laboratory, and DENV staff co-ordinate the monitoring program, perform data quality assurance, and maintain the official data archive.

The severity of acid rain impact is generally measured by computing how much sulphate (a measure of sulphuric acid) falls on each hectare of land over one year. In Canada, critical loads are defined as the level of acidic deposition that a specific area can tolerate without harm. Critical loads take into account the nature of individual watersheds and their susceptibility to the effects of acidification. Critical loads for acidification in New Brunswick range from less than 8 up to 11 kg/ha/yr of acid sulphate deposition. The lowest values of less than 8 kg/ha/yr are designed to protect the most sensitive areas that typically have granite bedrock (e.g. areas of southwestern and central northern New Brunswick), and 11 kg/ha/yr for most of the rest of the Province.

Sulphate wet deposition for the 10 year period of 1998-2007 is shown in Table 24. Acid deposition values in 2007 were lower in most areas as compared to deposition levels in 2006. This could be due to the decreased rainfall amounts in some of the areas where acid precipitation monitoring stations are located. For sites with a complete data record for the year, acid deposition in 2007 ranged from as low as 8.09 kg/ha/yr at Harcourt to as high as 12.09 kg/ha/yr at Fundy National Park.

Although Canada and US emissions of sulphur dioxide and nitrogen oxides have continued to decline since 1990 (Canada-United States Air Quality Agreement: 2008 Progress Report), the acid rain issue remains important for New Brunswick because critical loads for acid rain continue to be exceeded, especially in southern NB. As a result, more effort to reduce emissions is required to reduce acid deposition further and ensure that the more sensitive lakes and rivers are provided with long-term protection from acid damage.

The amount of acid precipitation is a naturally variable indicator of acid deposition because it is closely associated with the amount of precipitation that falls during the course of the year at a given monitoring site. As a result, there will always be significant variability in annual deposition values as a function of rain and snow levels each year.

Table 24. Sulphate wet deposition (kg/ha/yr) at New Brunswick monitoring sites, 1998-2007

Site	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
St. Maure	14.42	11.18	9.73	7.14	8.08	8.53	7.77	10.63	10.54	10.16
Robertville	13.53	10.61	9.48	7.98	10.08	7.25	7.48	11.36	12.13	9.08
Petit Paquetville	10.83	9.36	8.89	8.33	7.64	7.24	7.11	10.07	10.86	8.79
Nictau	15.04	11.19	---	9.367	9.59	7.08	8.00	9.31	11.47	7.68***
Trout Brook	11.26	8.44	8.36	9.89	9.12	9.04	6.42	10.74	10.83	8.73
Holtville	14.42	9.79	11.48	8.94	10.58	10.75	8.29	12.01	12.21	8.81
Harcourt	12.53	9.05	9.82	7.50	10.00	9.81	7.27	9.50	10.31	8.09
Canterbury	8.93	9.8	10.49	8.46	10.47	9.58	7.32	13.53	---	---
Fundy	18.28	13.99	19.04	10.62	15.07	13.23	12.66	15.43	16.69	12.09
South Oromocto Lake	16.86	11.52	13.17	9.60	10.95	11.14	---	---	11.71	10.68
Lakewood Heights	18.29	13.27	16.36	10.17	14.94	16.89	12.83	13.01**	14.49	11.62
Pennfield	17.89	13.93	14.20*	10.49	13.30	12.03	12.12	16.45	15.53	11.45
Coles Island	13.32	9.35	12.28	7.44	10.84	10.62	8.28	9.20	9.07	8.95

--- insufficient data
* 41 Weeks reporting
** 48 Weeks reporting
*** 49 Weeks reporting

Total annual precipitation for the year was near normal over the north and western areas of the Province. Southern and eastern areas were below normal with some areas along the Bay of Fundy coast having deficits greater than 250 mm for the year.

Another useful indicator of acid deposition is the average annual sulphate concentration in precipitation, averaged across all sites operating in each year. The results are shown in Figure 15, which also shows the number of sites that were in operation for at least a portion of each year. The trend overall is downward since 1989, although this downward trend appears to have moderated in recent years. The downward trend confirms that reductions in sulphur dioxide emissions in New Brunswick, elsewhere in eastern Canada and the United States have had a beneficial effect on acid rain in the province.

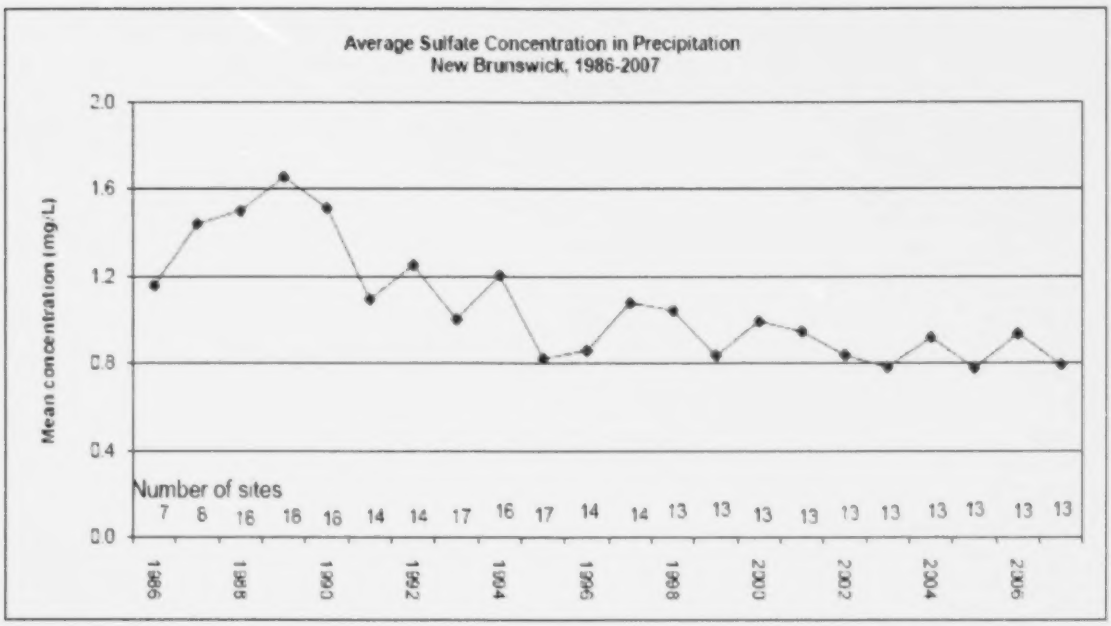
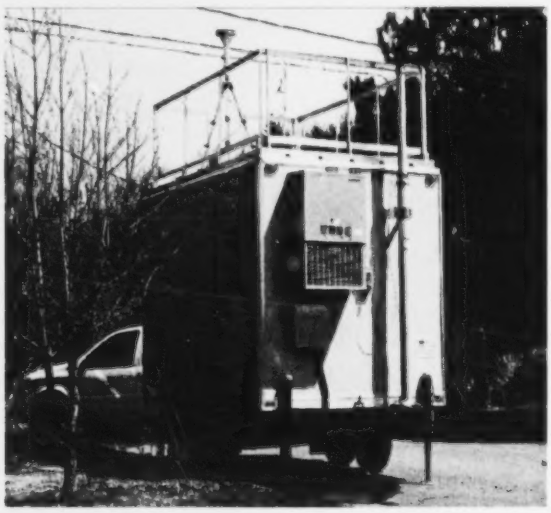


Figure 15. Network-wide mean annual sulphate concentration in precipitation in New Brunswick, 1986-2007.

7. MOBILE AIR QUALITY MONITORING UNIT

To help in evaluating air quality in New Brunswick, the DENV has outfitted a mobile air quality monitoring unit with support from Environment Canada. It augments monitoring carried out at established monitoring sites and can be moved to most areas of the province, fulfilling temporary monitoring needs. The vehicle is presently able to measure the following pollutants: sulphur dioxide, nitrogen oxides, ozone, total reduced sulphur (including hydrogen sulphide) and fine particulate matter ($PM_{2.5}$). The vehicle is also fitted with a retractable 10-metre mast with wind speed and direction instruments.



The mobile air monitoring vehicle is being used in the following applications:

- Assessment of the local impact of point or area emission sources
- An evaluation tool in responding to local air quality issues
- Site evaluation prior to establishing a permanent monitoring site
- Comparative analysis studies with permanent monitoring sites
- Validation of predictive air quality modelling studies
- Determination of background or baseline air quality
- Investigating a planned or sustained event that has potential for air quality impacts.

2007 Operations

The original air quality monitoring van was retired in 2007 and replaced by a modern stand-alone trailor supplied by the NAPS program. No monitoring was conducted using the new mobile unit in 2007.

8. LONG TERM AIR POLLUTION TRENDS

In addition to examining air quality monitoring results for a given year, it is often informative and revealing to compare annual results to previous years, and consider longer term trends. This provides information on how air quality may be changing over the years, and whether emission control measures as applied to industrial operations and consumer products (notably vehicles and fuels) are influencing long- term environmental quality. As mentioned in the introduction, air quality monitoring has been ongoing in parts of the province since the 1970s, especially in the Saint John region. In this section, data for key locations with long-term records are presented to provide information on air quality trends.

A. Carbon Monoxide

Customs Building

The only long-term site for this substance is the Customs Building site in uptown Saint John. The earlier part of the record (prior to 1991) is from the nearby Post Office location. Results are predominantly influenced by motor vehicle emissions. Generally, annual average levels of CO have improved over the long term since the 1980's. Even in recent years, the frequency of annual averages greater than 0.4 ppm has decreased. This could reflect the tighter vehicle emission standard resulting in lower emissions. In 2007, the annual average CO level of 0.2 ppm was the lowest on record.

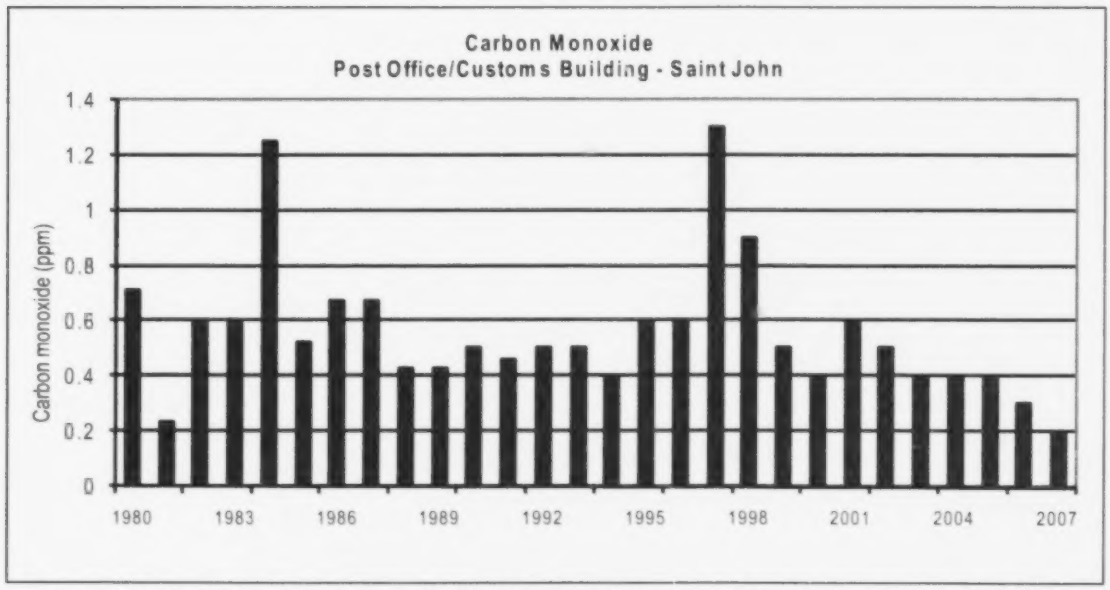


Figure 16. Annual carbon monoxide, Post Office/Customs Building, Saint John, 1980-2007.

Fredericton and Moncton

The record to date at these stations shows similar improvement as recorded at the Saint John-Customs location. CO in Moncton has been steadily decreasing since 2001 and levels in Fredericton have also improved since 2002. Results for 2007 are the same as 2006 at both sites.

B. Nitrogen Dioxide

Forest Hills

NO_2 is another key pollutant emitted by motor vehicles, as well as industrial sources. The overall NO_2 trend at this site has been downward since 1981.

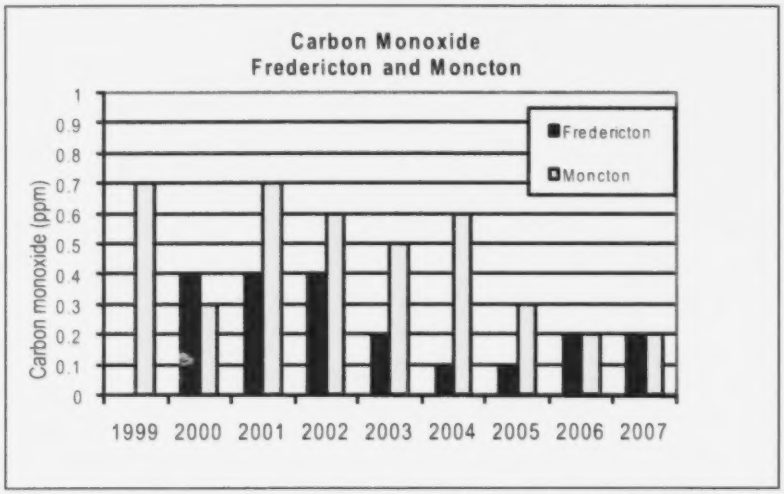


Figure 17. Annual mean carbon monoxide, Fredericton and Moncton, 1999 -2007.

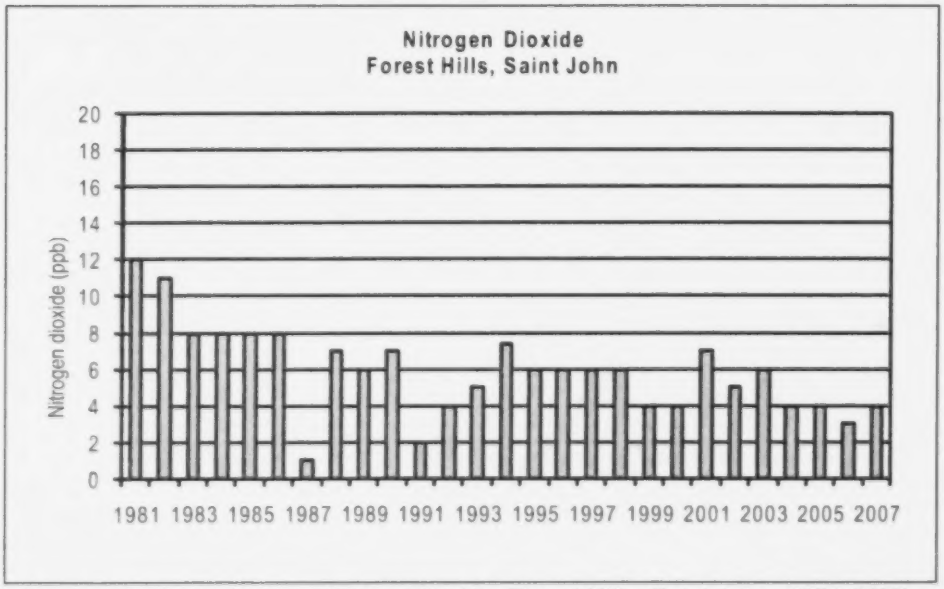


Figure 18. Annual mean nitrogen dioxide, Forest Hills, Saint John, 1981-2007.

Forest Hills is influenced by emissions from local industries as well as the more diffuse sources such as vehicles.

Customs Building

In 2007, the annual mean continued its downward trend of recent years and stood at 0.6 ppb.

Fredericton and Moncton

The record for these centres is less than 10 years, but is presented for comparison. NO_2 values appear to be slighly higher on average at the Moncton station, but the trend is downward overall at both sites. 2007 results were slightly higher than 2006 at both Fredericton and Moncton stations.

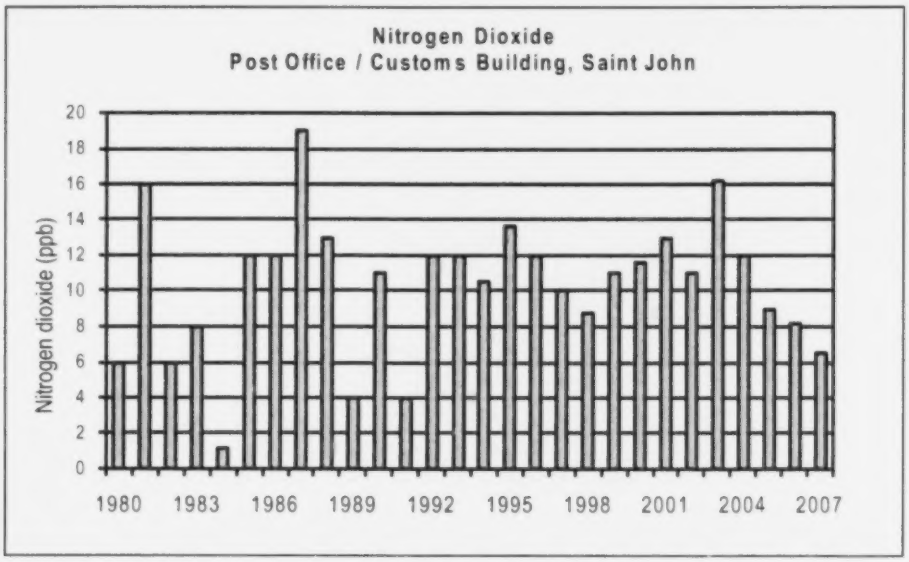


Figure 19. Annual mean nitrogen dioxide, Customs Building, Saint John, 1980-2007.

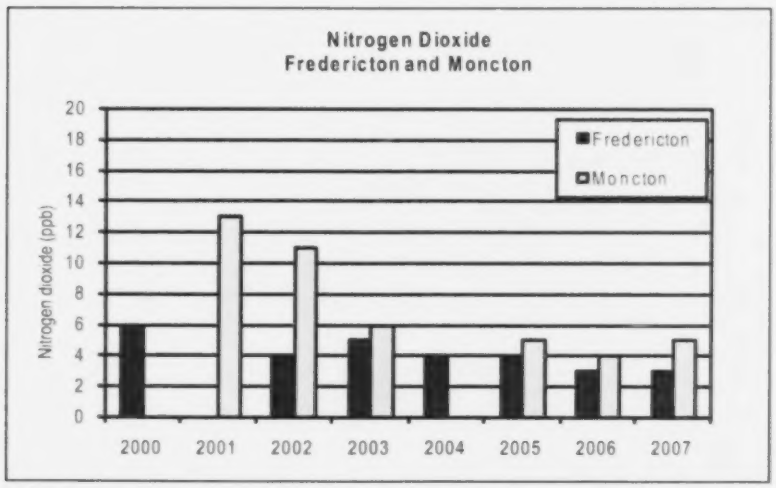


Figure 20. Annual mean nitrogen dioxide, Fredericton and Moncton, 2000-2007.

C. Sulphur Dioxide

Forest Hills

Figure 21 shows dramatic improvement in average SO_2 levels at Forest Hills over a 30 year period from 1977-2007. This reflects emission reductions that have been achieved by several local industries including power generating stations, the pulp and paper industry and an oil refinery.

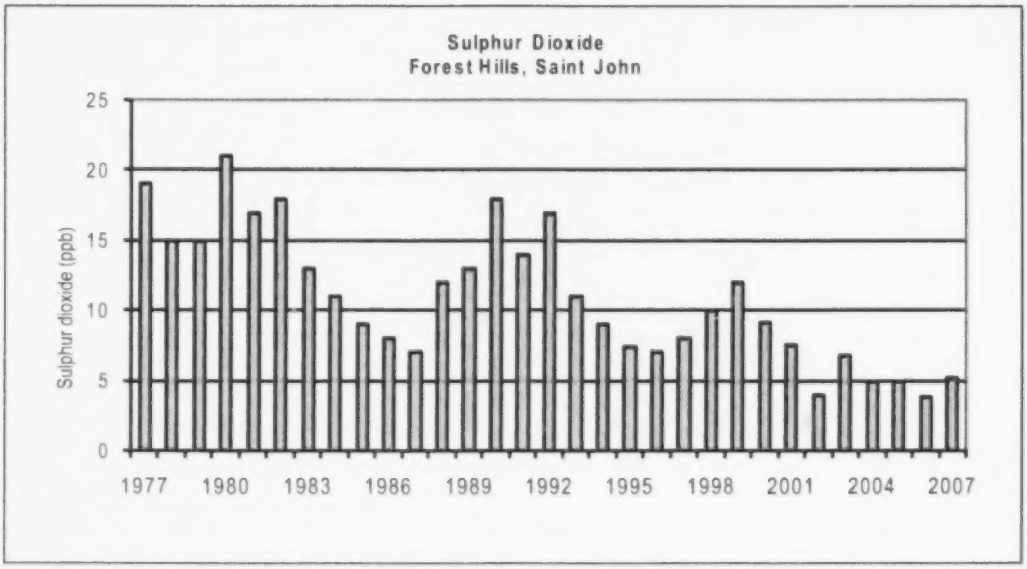


Figure 21. Annual mean sulphur dioxide, Forest Hills, Saint John, 1977-2007.

Customs Building

In uptown Saint John, as represented by records from the Post Office and Customs Building sites, the SO_2 trend has been downward since the mid-1970s. Decreasing concentrations in this part of the city are probably due to a variety of reasons, including reduced emissions from the Reversing Falls pulp and paper mill, which fell by about 70% from 1980 to 1995. Reduced emissions from the NB Power Courtenay Bay generating station (down 74% from 1990 to 1995) may also be partly responsible. Other reasons include the closure of the Lantic sugar refinery in 2002, new regulations reducing the sulphur content of gasoline, and the increasing use of natural gas.

The annual mean in 2007 was 2 ppb (Figure 22).

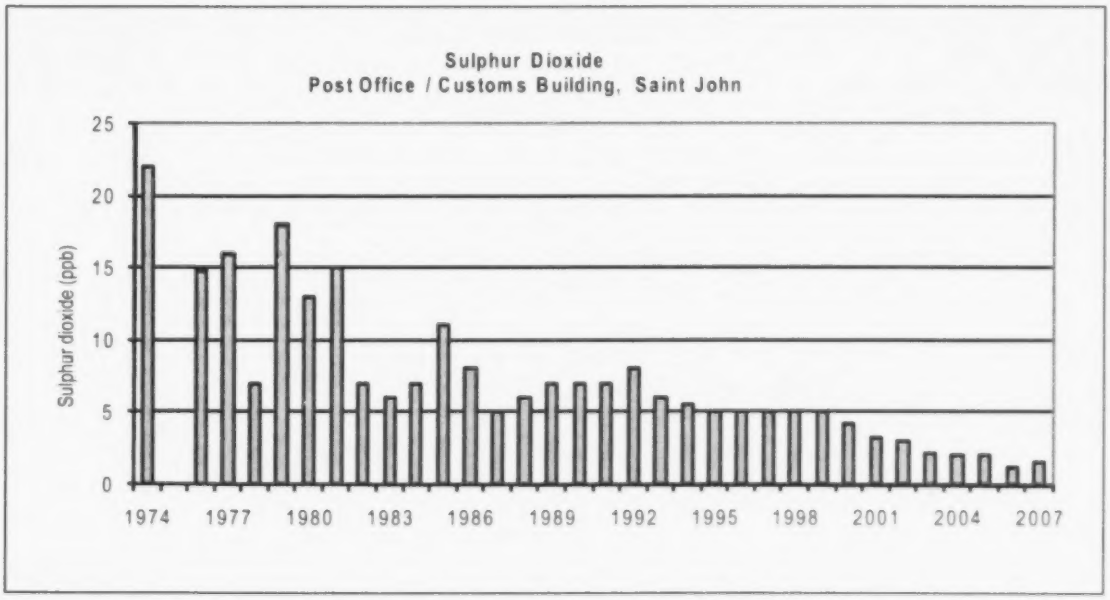


Figure 22. Annual mean sulphur dioxide, Post Office/Customs Building, Saint John, 1974-2007.

Hillcrest

This site in west Saint John is influenced by several sources of SO_2 including the Reversing Falls pulp and paper mill and the Moosehead brewery. Since 1992, the data show a rising trend until 1997 and then falling thereafter. In 2007, the annual mean was 3 ppb (Figure 23).

Saint John – 3 Site Average

To examine the long term trend on city-wide basis, a composite annual average of three sites (Hillcrest, Forest Hills and the Customs Building) operated by DENV in the Saint John area was calculated. The trend is shown in Figure 24.

The results show average SO_2 level of 6-7 ppb during the 1990s, after which they began to decline to the point where in recent years average levels of 2-3 ppb occur.

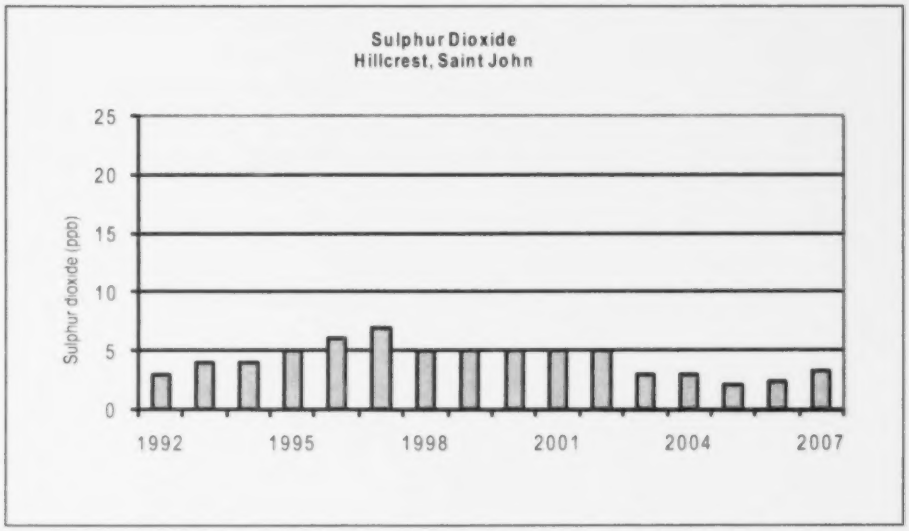


Figure 23. Annual mean sulphur dioxide, Hillcrest, Saint John, 1992-2007.

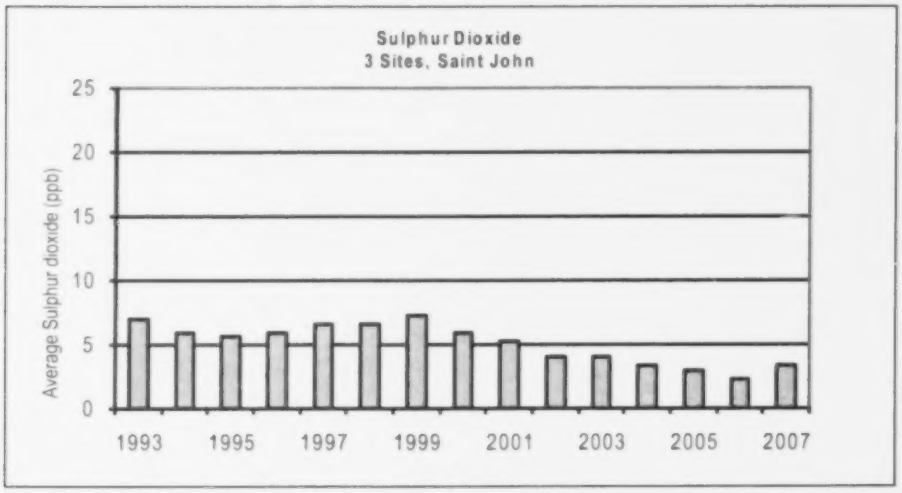


Figure 24. Trend in sulphur dioxide in Saint John, 3 site composite average, 1993-2007.

D. Ground Level Ozone

As explained in section 4, O_3 is a regionally transported pollutant which is not emitted directly from smokestacks or tailpipes, but which forms in the air when other pollutants mix and react together. As such, trends in O_3 are due to changing emissions of the pollutants that lead to O_3 formation (NO_2 and VOC) over a large upwind area of eastern Canada and the United States. Seasonal weather, especially summer conditions, also has a major influence on the amount of O_3 affecting New Brunswick.

Forest Hills

At Forest Hills O_3 levels do not appear to have changed significantly overall since the 1980s, when O_3 levels were first recorded at this site (Figure 25).

Customs Building

At the Customs site, annual averages for O_3 have also been variable over the period of record and like Forest Hills, there is no clear trend over the long term (Figure 26).

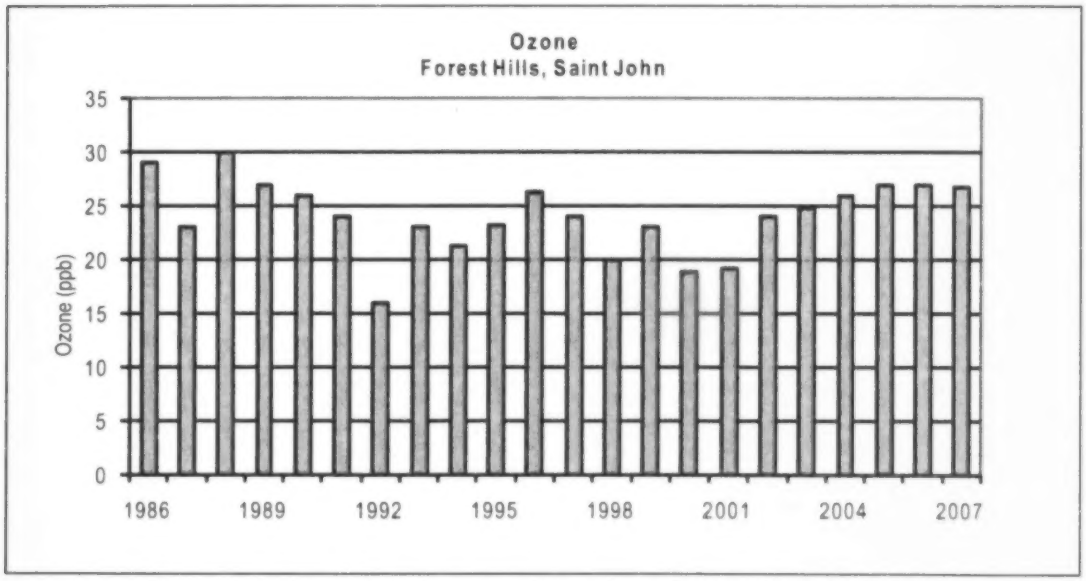


Figure 25. Annual mean ozone, Forest Hills, Saint John, 1986-2007.

Point Lepreau

Data for this site are included to provide a perspective from a rural location which is almost always upwind of major sources of air pollutants in southern New Brunswick. Annual O_3 levels are usually somewhat higher than those seen in the Saint John area (Figure 27). This is because urban sites typically have higher concentrations of pollutants that react with and remove O_3, such as NO_x.

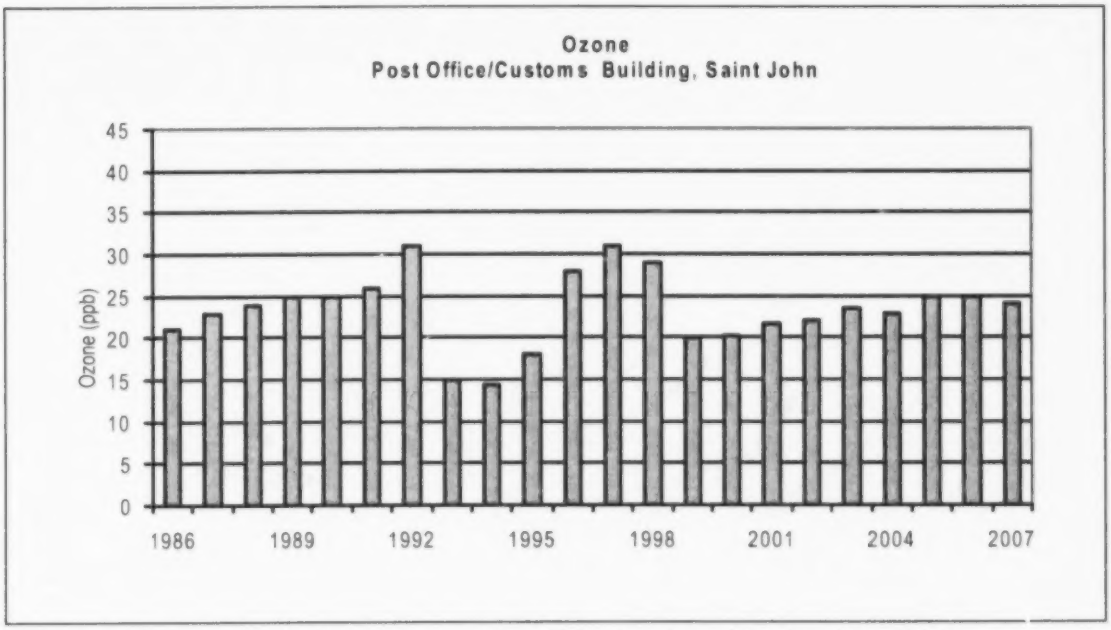


Figure 26. Annual mean ozone, Post Office/Customs Building, 1986-2007.

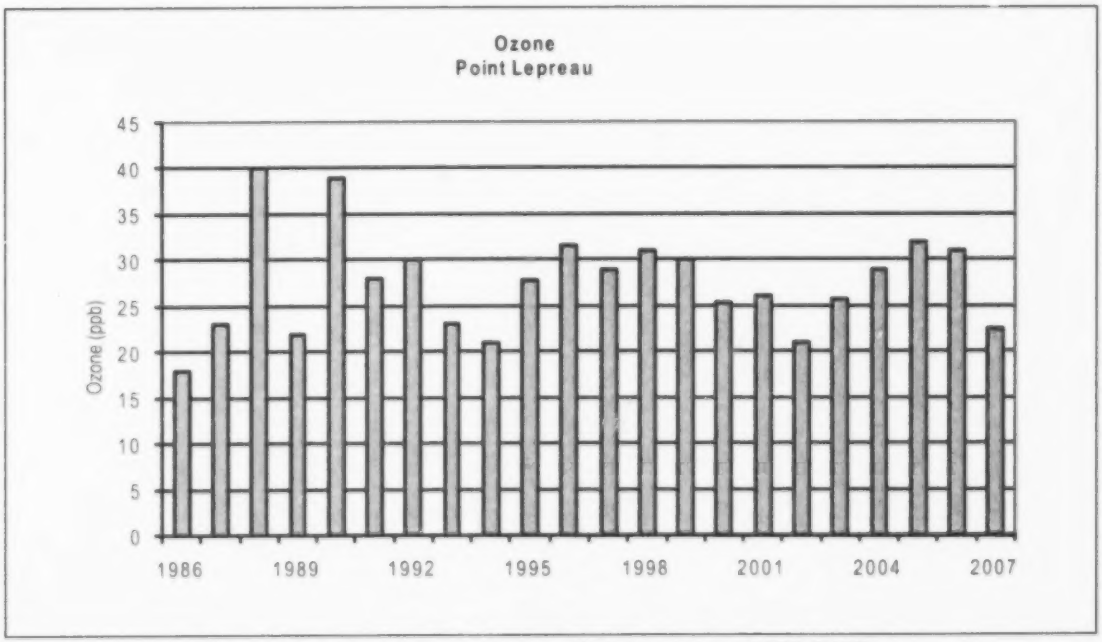


Figure 27. Annual mean ozone, Point Lepreau, 1986-2007.

Provincial Ozone Trends

Figure 28 shows a composite trend based on all O_3 sites in the province. The number of sites has increased substantially over the period of record, from three initially, to 14 in 2006. The latter half of the record is therefore more meaningful.

Examining the record since 1986, a linear trend line indicates no change in the province-wide O_3 average.

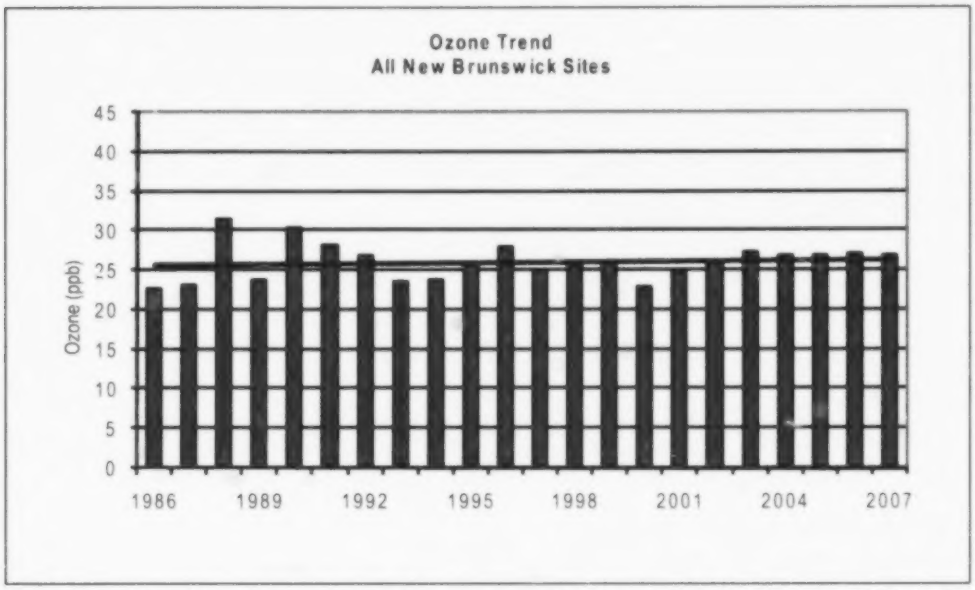


Figure 28. Trend in ozone, composite average of all New Brunswick sites, 1986-2007.

E. Volatile Organic Compounds

VOCs have been measured at two locations (Forest Hills and Point Lepreau) since 1992, as noted in section 3. Routine analyses provide results for over 150 VOCs. In July 2000, sampling began at Champlain Heights School, a site within 0.5 kilometers of the Irving Oil refinery complex in east Saint John. Trends for selected VOCs are presented in this section.

One clear finding from the VOC sampling program is that concentrations of most VOCs are substantially higher at Forest Hills and Champlain Heights than at Point Lepreau. This is consistent with the location of Forest Hills and Champlain Heights in an industrial/urban setting and Point Lepreau in a relatively remote, rural setting.

Figure 29 shows trends in average total VOC concentrations for all sites since 1992.

These results clearly show the difference in average VOC levels between the three sites. At Forest Hills, total VOC concentrations appear to have decreased in the four year period from 2004-2007 in comparison to the previous four year period. There has been relatively little change at Point Lepreau. The VOC trend at Champlain Heights suggests a decreasing trend after 2003. Emissions from the refinery complex clearly influence both Forest Hills and Champlain Heights locations.

Compounds such as butane and isopentane (Figure 30), which are major components of gasoline vapour, generally reflected the total VOC trend at the two Saint John sites.

Some potentially toxic VOCs decreased from the early to the late 1990s, and have been more variable since then. Figure 31 shows the trend for benzene, Figure 32 for butadiene and Figure 33 for xylenes.

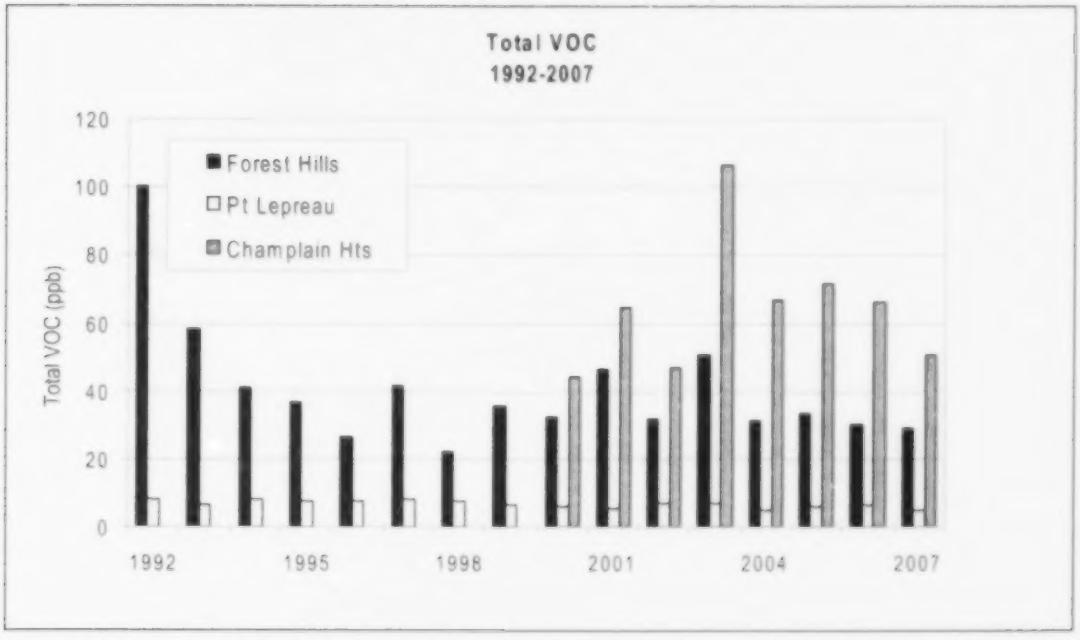


Figure 29. Average total VOC concentration at provincial VOC monitoring sites, 1992-2007.

Benzene is an important component of gasoline. Benzene levels have not changed appreciably in the past 3 years at Champlain Heights. However a decrease in annual average concentrations is apparent over the same time period and the longer term at Forest Hills and Point Lepreau.

Butadiene is emitted during petroleum refining and subsequent handling, as well as from internal combustion engines (e.g. CARB, 1992). Butadiene concentrations appear similar at both urban sites and some improvement is apparent since 2000.

Xylenes are associated with vehicle exhaust (Multistakeholder NOx/VOC Science Program, 1997a). As with benzene, a decreasing long term trend is apparent for xylenes at the Forest Hills site. The Champlain Heights' trend suggests little change over a shorter time frame.

The oil refinery began a leak test and repair program in 1995, designed to reduce VOC emissions from leaking equipment such as pumps and valves. This may have been a factor in the observed decreases of many VOCs, although the bulk of the decrease took place between 1992 and 1995. Other changes may have had some influence, such as an increasing proportion of vehicles on the road being equipped with emission control devices.

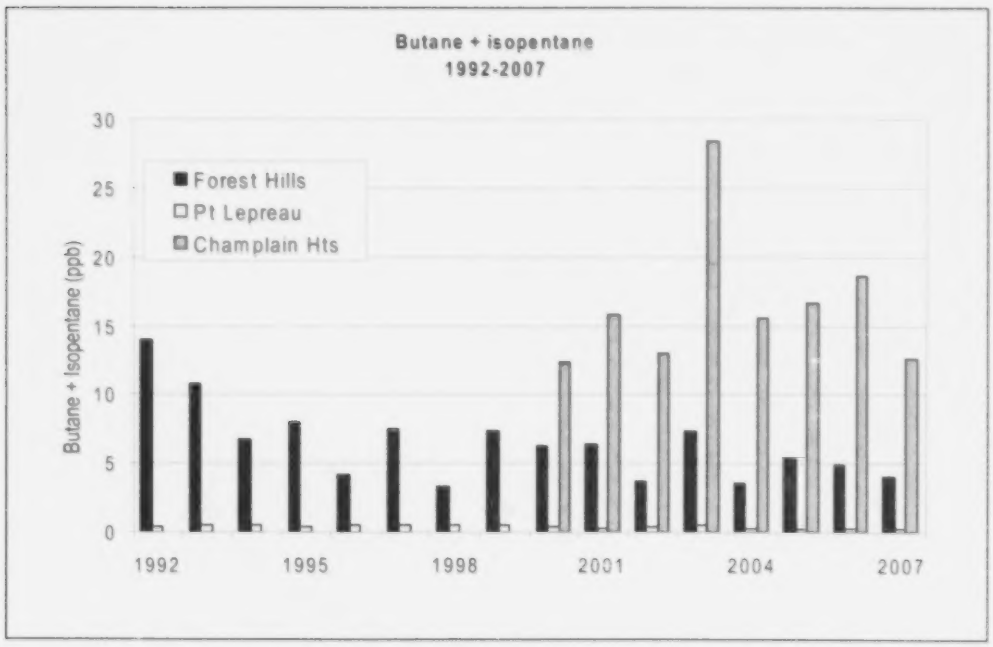


Figure 30. Annual average concentration of butane plus isopentane at provincial VOC monitoring sites, 1992-2007.

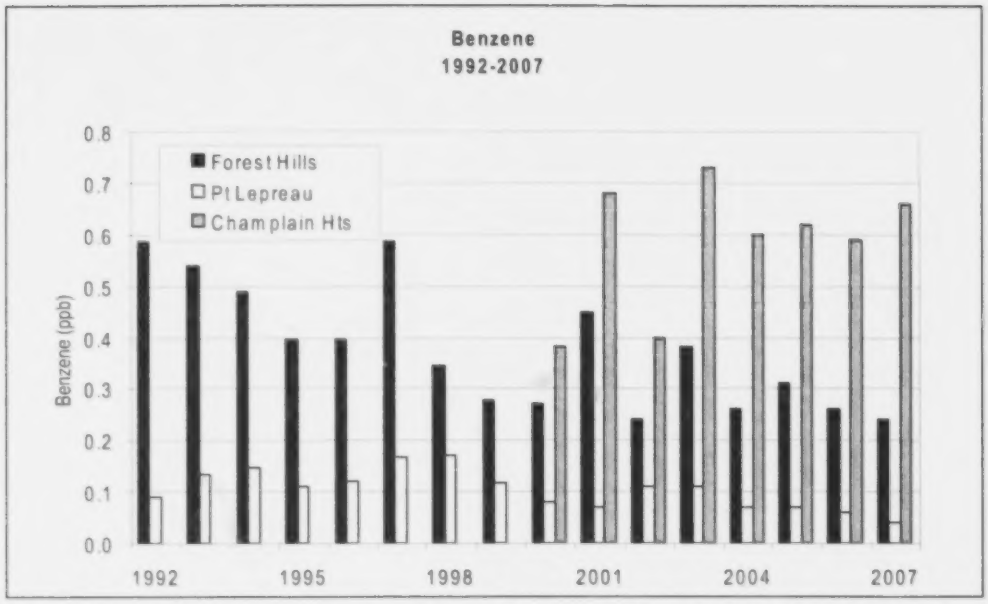


Figure 31. Annual average concentration of benzene at provincial VOC monitoring sites,1992-2007.

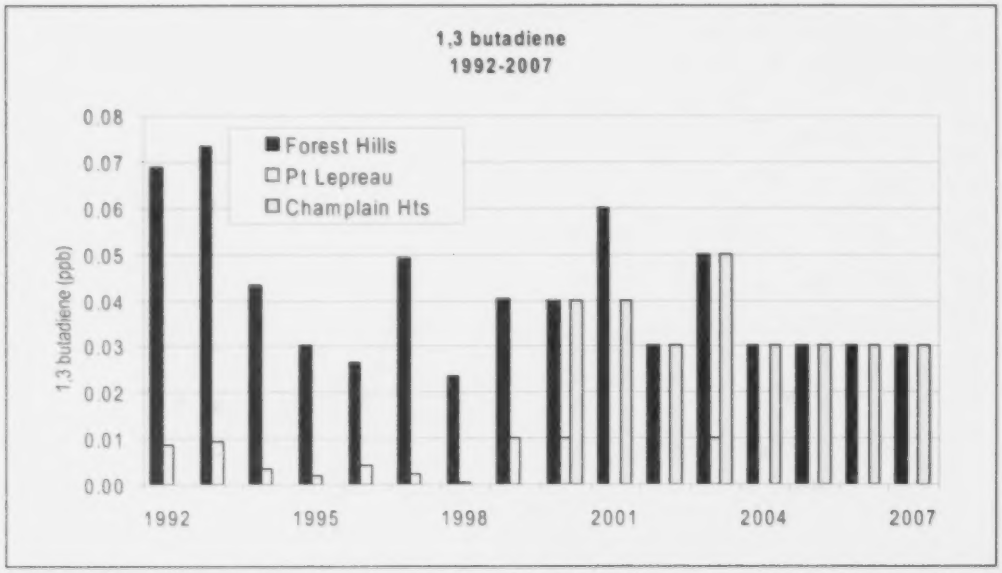


Figure 32. Annual average concentration of 1,3 butadiene at provincial VOC monitoring sites, 1992-2007.

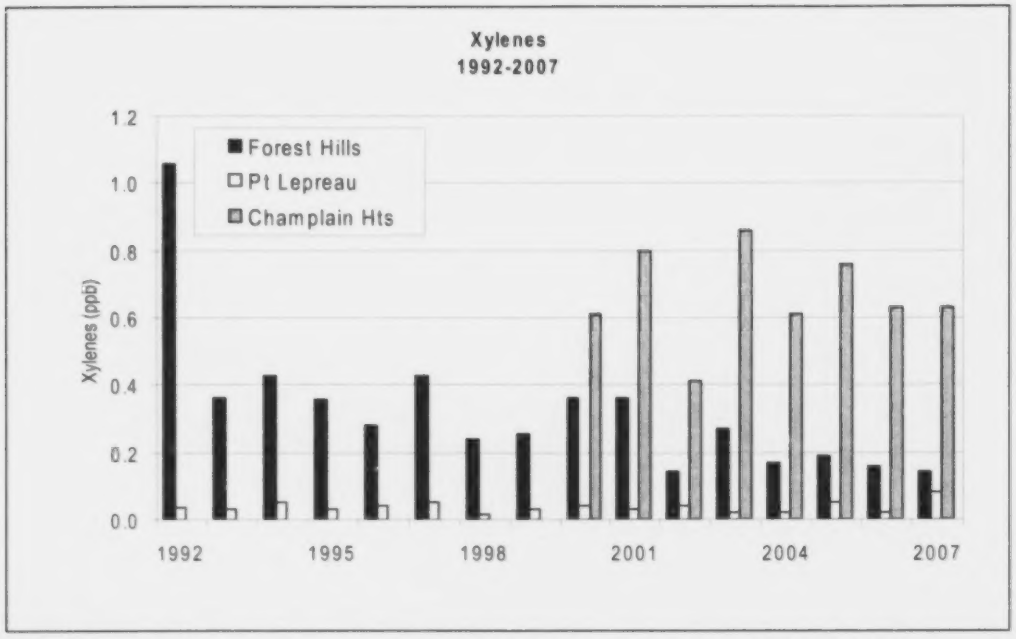


Figure 33. Annual average concentration of xylenes at provincial VOC monitoring sites, 1992-2007.

In Table 25, additional background information is provided on VOCs that are of special concern. These compounds are found on the "priority lists" of many nations, states and provinces, for special attention in term of control programs, including actions such as minimising use, emissions, and human exposure.

It is apparent that a lot of these compounds have features in common. Many are found in crude oil or are produced as part of the petroleum refining process and they are often used as solvents, or in paint or plastics. Burning is also a potential source of many of these VOCs. Although these compounds have been identified for priority attention, in many cases there is still relatively little information available on their toxicity. In such cases they are often not classifiable in terms of cancer-causing potential, and sufficient detail may not be available to determine if ambient air quality guidelines should be established. For many of the VOCs in this list, technical data sheets note that they may affect the nervous system. In cases where this is known from clinical trials or actual human exposure, it is usually at very high concentrations, much greater than what would be found in the outdoor environment.

Table 25. Additional information on VOCs of special concern.

	Cancer-causing	Sources	Other details
1,3 butadiene	Yes (OSHA)	Refining, gasoline, plastics industry, rubber manufacturing, burning.	Most is used to make synthetic rubber.
Benzene	Yes (OSHA, IARC, EPA). Linked with leukaemia.	Refining, gasoline, burning, coal coking.	High-volume industrial compound.
Toluene	No, or unclassifiable (EPA)	Refining, gasoline, solvents.	High levels can affect the nervous system.
Ethylbenzene	No, or unclassifiable (EPA)	Petroleum products, adhesives, paint.	Limited health impact information available.
Xylenes	Insufficient information to classify (EPA, IARC)	Solvents, printing, paint, vehicle exhaust.	High levels can affect the nervous system.
Styrene	Possibly (IARC)	Plastics industry.	High-volume substance used in many products containing plastic or insulation.
Chloromethane	Possibly (EPA)	Burning, natural sources, swimming pools.	High levels can injure the nervous system.
Vinyl chloride	Yes (OSHA). Linked to cancer of liver, brain and lung.	Plastics industry.	No natural sources. Used to make PVC.
1,1 dichloroethylene	Suspected (EPA)	Adhesives and packaging material manufacture.	High levels can cause liver and kidney damage.
Dichloromethane	Probable (EPA), "may cause cancer" (WHO)	Paint stripper, industrial solvent.	No natural sources.
1,2 dichloroethane	Potential (EPA)	Solvent use, plastics and textiles manufacture.	Can cause nervous system disorders and adverse lung, liver and kidney effects.
Carbon tetrachloride	Possibly (IARC), probable (EPA)	Most uses banned. Formerly widely used as a solvent, propellant, and fire extinguishing agent.	No natural sources. Stable from 30-100 years in the atmosphere.
1,2 dichloropropane	Not classifiable (IARC)	Relatively few uses. Chemical intermediate for making other compounds.	No natural sources. High levels may cause organ failure or lung damage.
Trichloroethylene	Probable (IARC)	Paint, solvent use.	No natural sources but persistent in the environment, especially in soils and groundwater.
1,1,2 trichloroethane	Not classifiable (IARC)	Solvent use, and used as a chemical intermediate.	Persistent in groundwater; breaks down slowly in air.
Ethylene dibromide	Potential (EPA)	Pesticide and solvent use. Dye manufacture.	Known to affect the liver, stomach and testes.
Tetrachloroethylene	"May be reasonably anticipated to be" (DHHS)	Dry cleaning, metal degreasing.	High concentrations affect the nervous system.
1,1,2,2, tetrachloroethane	Possible (EPA)	Chemical intermediate.	No longer used as an end product. Previously used as a solvent and in pesticides.
Formaldehyde	Yes (OSHA)	Used in plastics resins, plywood, paper and fertilizers.	Also found in photochemical smog. Can irritate eyes, nose and throat.
Acetaldehyde	Probable (EPA, IARC)	Acetic acid manufacture.	Many uses including as a food additive.
MTBE	Not classified by IARC, EPA or DHHS	Gasoline additive.	Characteristic turpentine-like smell. Contaminates and persists in groundwater.

Notes: EPA = United States Environmental Protection Agency; IARC = International Agency for Research on Cancer; DHHS = US Department of Health and Human Services. Where sources are given, the list provides major examples but is not exhaustive. In most cases there will be additional sources.

9. QUALITY ASSURANCE

The provincial air quality network quality assurance program consists of a number of components, with input and responsibility from both DENV and Environment Canada. Sites managed by DENV are operated according to procedures and methods endorsed by the National Air Pollution Surveillance (NAPS) program, headquartered in Ottawa.

The objective of quality assurance procedures is to provide accurate, representative, comparable, high quality data using consistent operational protocols and standards. The NAPS agency provides calibration, reference standards, and technical support to DENV. Calibration gases are certified for accuracy and are either "primary reference standards" or are traceable to primary standards maintained by the National Institute of Standards and Technology (NIST) in Maryland.

Instrumentation technologies used in both the provincial and industry networks must satisfy the requirements of the United States Environmental Protection Agency (EPA) as equivalent or reference method for ambient air monitoring. Methods not yet certified by the EPA are used if approved and tested by the NAPS agency.

Quality assurance tasks in the operation of monitoring stations include regular site inspections, instrument response verifications and analyzer calibrations.

Air quality monitoring analysers are specialised instruments, requiring regular maintenance to ensure acceptable operation. In addition, calibration procedures are necessary to ensure accurate results are obtained. For instruments measuring pollutants in gas form, calibration involves introducing known concentrations of the pollutant gas to the analyser, and monitoring the response. Three or four concentration values are used when performing such a "multipoint" calibration. Certified flow, temperature and pressure standards are used for equipment which measures particulate matter.

Audits of sites operated by DENV are performed by Environment Canada on randomly selected sites within the provincial network. These audits are completed every two years to ensure acceptable data quality. An interlaboratory testing program is also conducted annually. This consists of the analysis of gases supplied "blind" (i.e. with no information on the true concentration) by the NAPS laboratory. DENV technicians analyze the blind test gas using their calibration equipment and send the results to NAPS, who return a report on performance to the province. This serves to standardize the performance of calibration systems within the province and across the country.

Industry network audits are performed by DENV every one or two years, using NAPS certified standards (see the following section).

After data have been acquired, they are all validated by DENV. This involves examining results, taking into account instrument records, especially "zero and span drift" (measures of internal instrument changes), other site records, maintenance procedures, calibration of the analyzers, adjustments made to operating settings, performance and history of the analyzers, seasonal conditions, and changes and levels of other pollutants during a given time frame.

Audits of Industry-Operated Sites

To ensure data quality, DENV technicians visit the monitoring sites operated by industries in New Brunswick, and perform independent site audits. It is normal to check all operating analysers at least once per year, or more often if required. Audits help identify and solve problems, prevent problems from developing, and assure data quality within the provincial monitoring system.

Results of air quality monitoring audits in 2007 are summarised in Table 26. A total of 28 instrument audits were carried out in 2007.

Table 26. Air quality site audits, 2007.

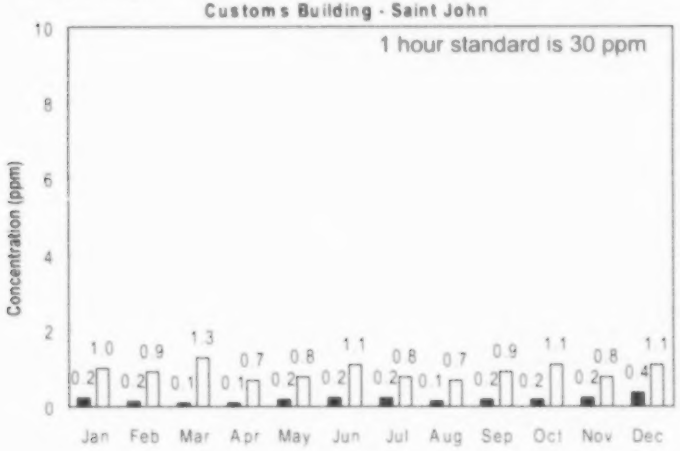
Industry	Site	Instrument	Date	Absolute Difference From Standard (%)	Pass/Fail
A/V cell	Boom rd.	SO2	6-Nov-07	2.0	P
	Beauvista	SO2	6-Nov-07	0.5	P
	Beauvista (not in C of A)	NOX	6-Nov-07	4.0	P
Fraser Inc/Nexor	Cormier School	SO2	7-Nov-07	4.0	P
	St-Mary's	SO2	7-Nov-07	3.0	P
Irving Pulp and Paper	Sherbrook	TRS	3-Apr-07	37.5	F (Note 1)
	Indian Town	TRS	4-Apr-07	2.0	P
	Milford	TRS	18-Apr-07	19.5	F (Note 1)
Irving Oil Limited	Forest Products	SO2	26-Apr-07	2.0	P
	Silver Falls	SO2	1-May-07	3.5	P
	Grandview West 1	SO2	18-Apr-07	1.0	P
	Grandview West 2	NOX	18-Apr-07	5.0	P
	Midwood Ave	SO2	24-Apr-07	4.0	P
NB Power Millbank	Lower Newcastle	NOX	16-Aug-07	1.0	P
		SO2	16-Aug-07	3.5	P
	Rockcliff	NOX	16-Aug-07	1.0	P
		SO2	16-Aug-07	4.0	P
NB Power Belldune	Municipal site	NOX	1-Oct-07	2.5	P
		SO2	1-Oct-07	3.5	P
		BAM 1020--PM-2.5	1-Oct-07	1.0	P
	Belldune East	NOX	2-Oct-07	2.4	P
		SO2	2-Oct-07	1.0	P
		BAM 1020--PM-2.5	2-Oct-07	8.0	P
	Jaquet River	SO2	1-Oct-07	1.5	P
	Pointe Verte	SO2	2-Oct-07	9.6	P
Brunswick Smelter	Chalmers site	SO2	5-Nov-07	1.0	P
	Boulay Farm	SO2	5-Nov-07	3.0	P
	Town Site	SO2	5-Nov-07	0.6	P

Note 1: Instrument malfunctioning; serviced and calibrated May 2007

APPENDIX 1:
DETAILED MONTHLY MONITORING RESULTS FOR 2007

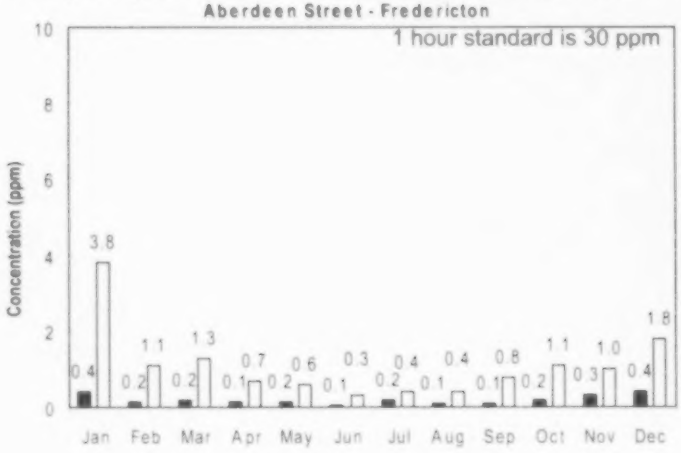
Monthly average and maximum 1 hour values of Carbon Monoxide in 2007

Customs Building - Saint John



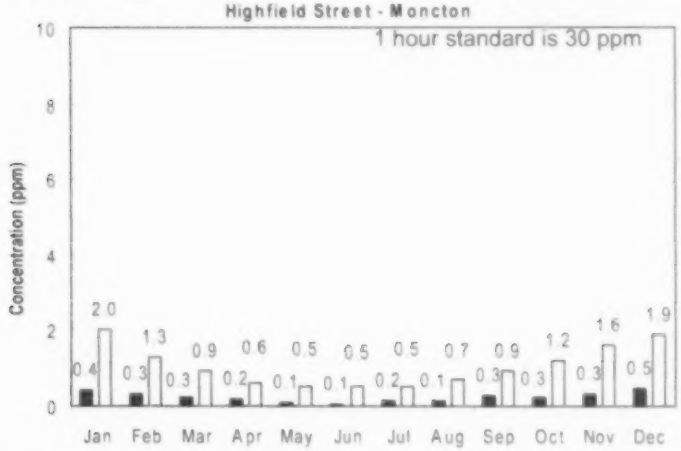
Monthly average and maximum 1 hour values of Carbon Monoxide in 2007

Aberdeen Street - Fredericton



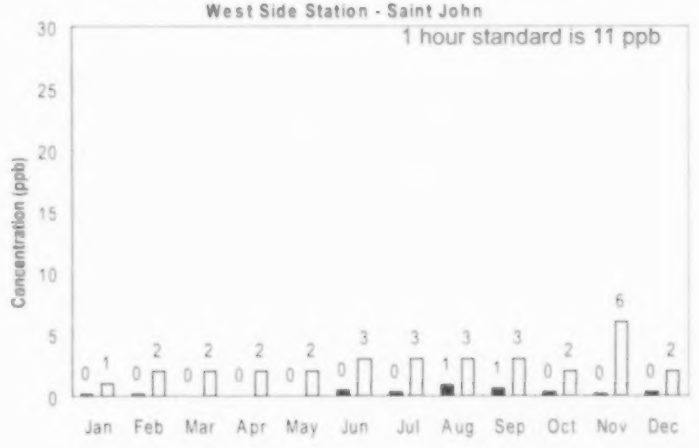
Monthly average and maximum 1 hour values of Carbon Monoxide in 2007

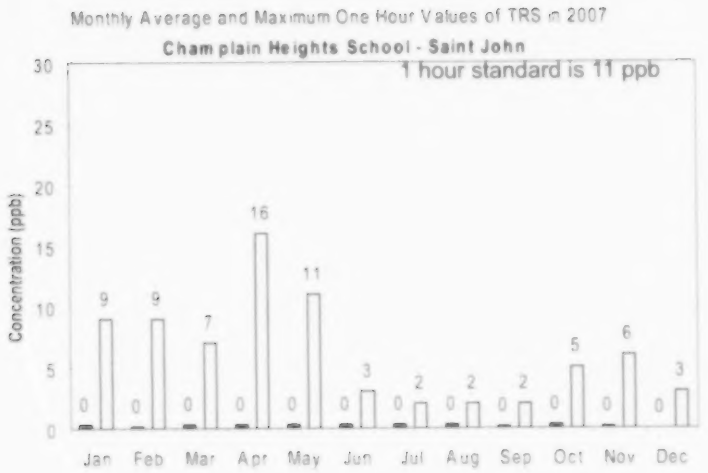
Highfield Street - Moncton

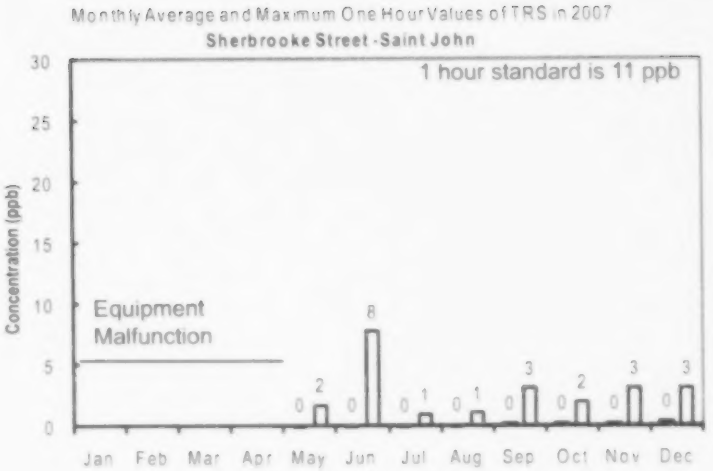


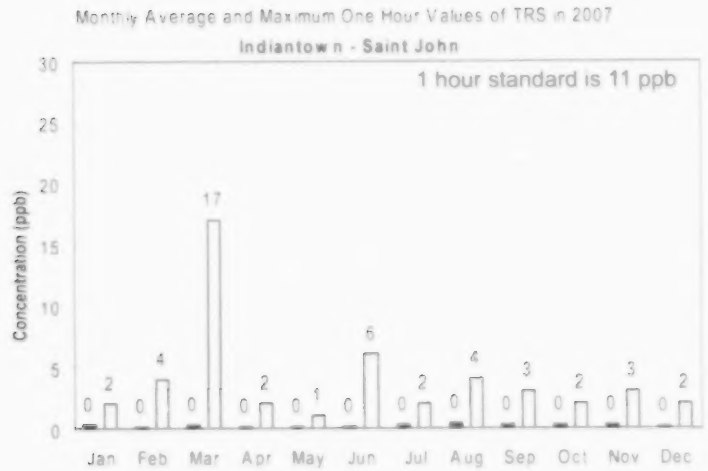
Monthly Average and Maximum One Hour Values of TRS in 2007

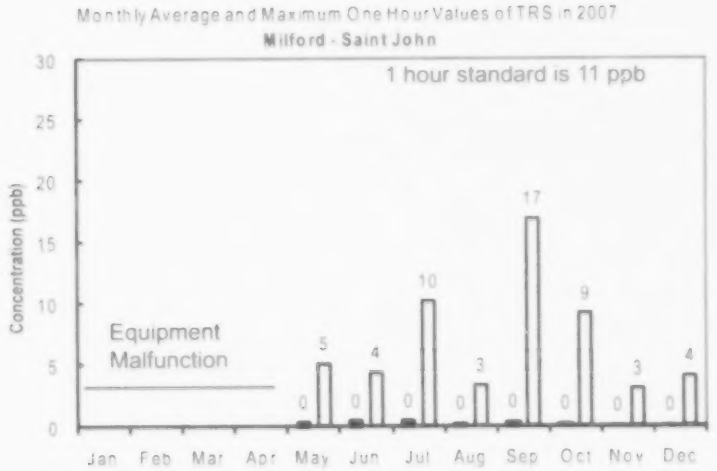
West Side Station - Saint John

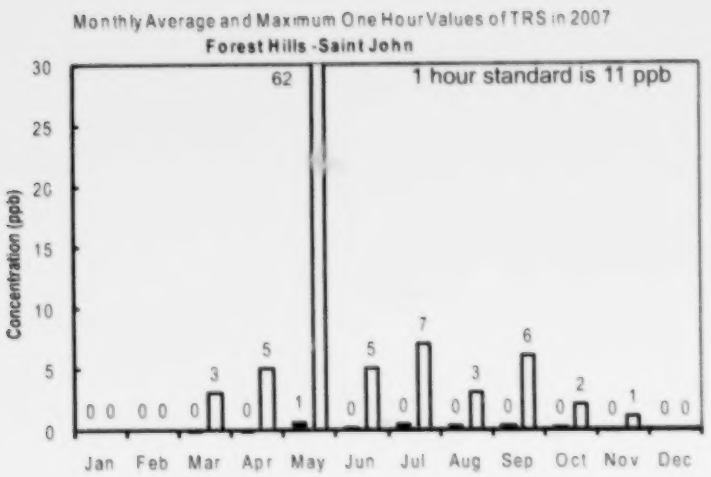


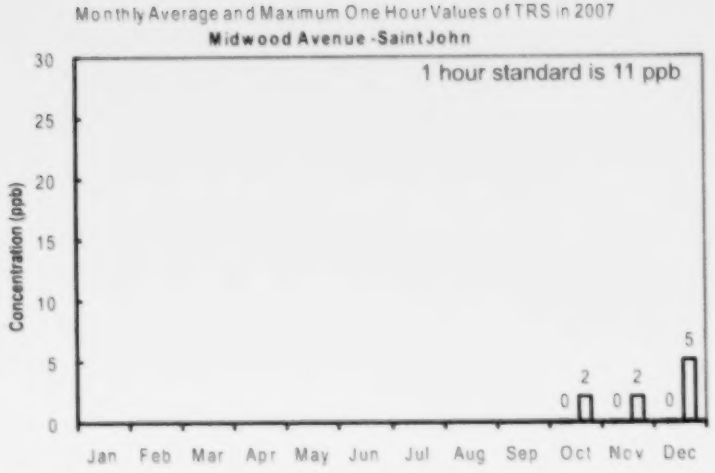

Monthly Average and Maximum One Hour Values of TRS in 2007
Champlain Heights School - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0 5 10 15 20 25 30
0 9 0 9 0 7 0 16 0 11 0 3 0 2 0 2 0 2 0 5 0 6 0 3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

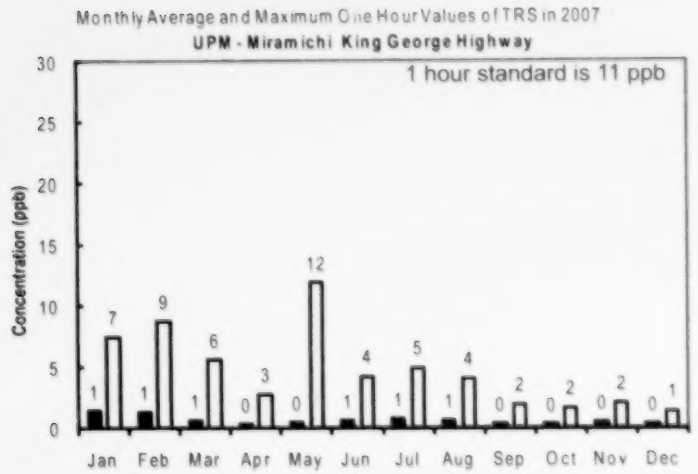

Monthly Average and Maximum One Hour Values of TRS in 2007
Sherbrooke Street - Saint John
1 hour standard is 11 ppb
Equipment Malfunction
Concentration (ppb)
0 5 10 15 20 25 30
0 2 0 8 0 1 0 1 0 3 0 2 0 3 0 3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

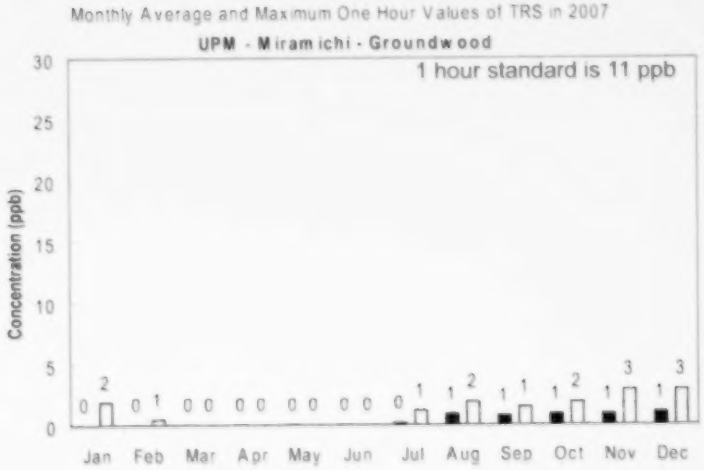

Monthly Average and Maximum One Hour Values of TRS in 2007
Indiantown - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0 5 10 15 20 25 30
0 2 0 4 0 17 0 2 0 1 0 6 0 2 0 4 0 3 0 2 0 3 0 2
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of TRS in 2007
Milford - Saint John
1 hour standard is 11 ppb
Equipment Malfunction
Concentration (ppb)
0 5 10 15 20 25 30
0 5 0 4 0 10 0 3 0 17 0 9 0 3 0 4
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of TRS in 2007
Forest Hills - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0 0 0 0 0 3 0 5 1 62 0 5 0 7 0 3 0 6 0 2 0 1 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

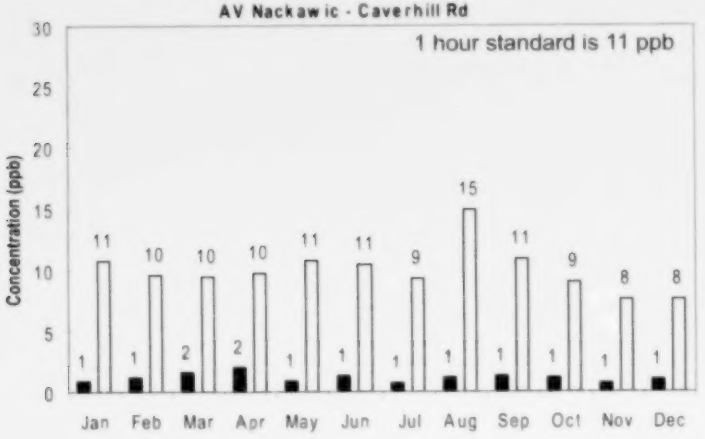

Monthly Average and Maximum One Hour Values of TRS in 2007
Midwood Avenue - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0 2 0 2 0 5
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of TRS in 2007
UPM - Miramichi King George Highway
1 hour standard is 11 ppb
Concentration (ppb)
1 7 1 9 1 6 0 3 0 12 1 4 1 5 1 4 0 2 0 2 0 2 0 1
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of TRS in 2007
UPM - Miramichi - Groundwood
1 hour standard is 11 ppb
Concentration (ppb)
0 2 0 1 0 0 0 0 0 0 0 0 0 1 1 2 1 1 1 2 1 3 1 3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

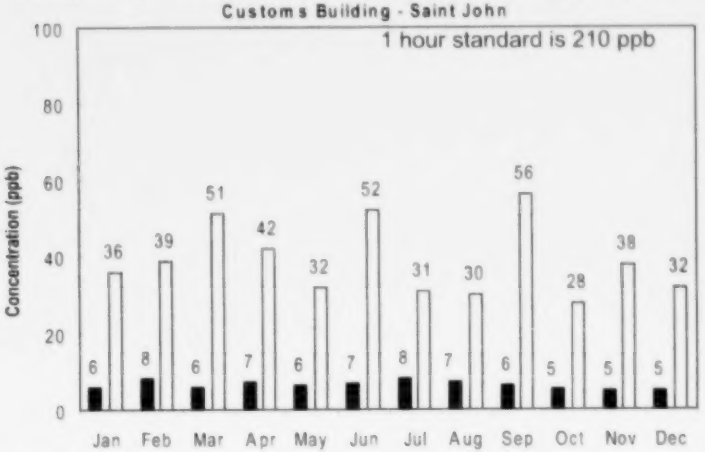
Monthly Average and Maximum One Hour Values of TRS in 2007

AV Nackawic - Caverhill Rd



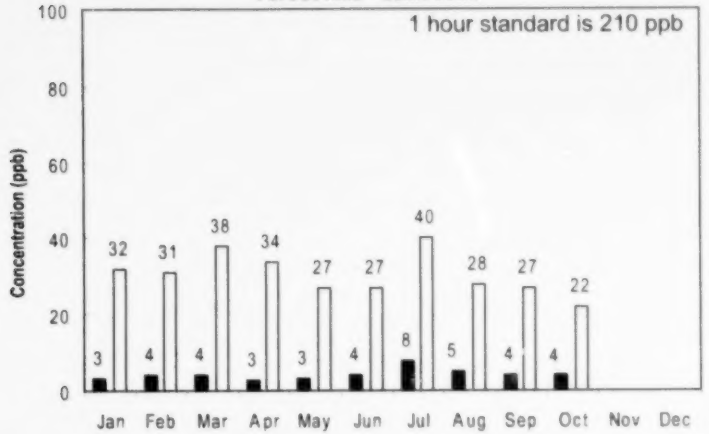
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

Customs Building - Saint John



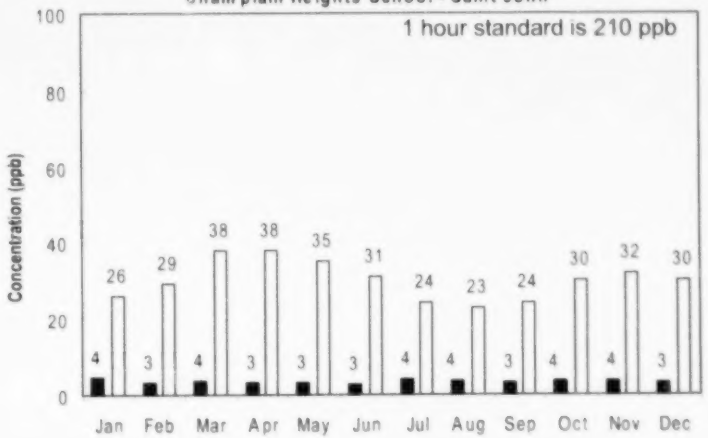
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

Forest Hills - Saint John



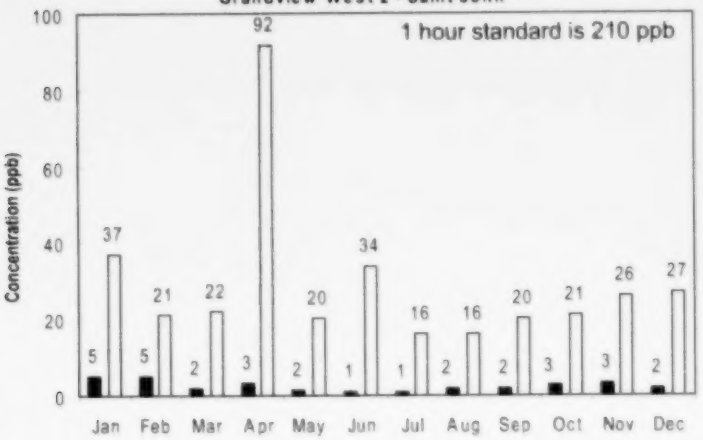
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

Champlain Heights School - Saint John



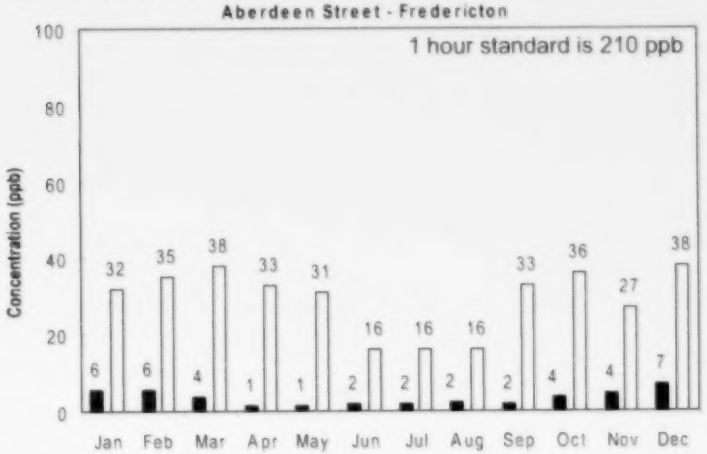
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

Grandview West 2 - Saint John



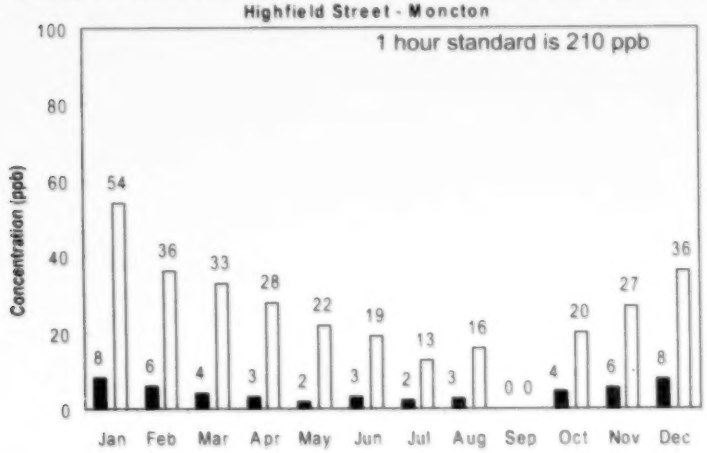
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

Aberdeen Street - Fredericton



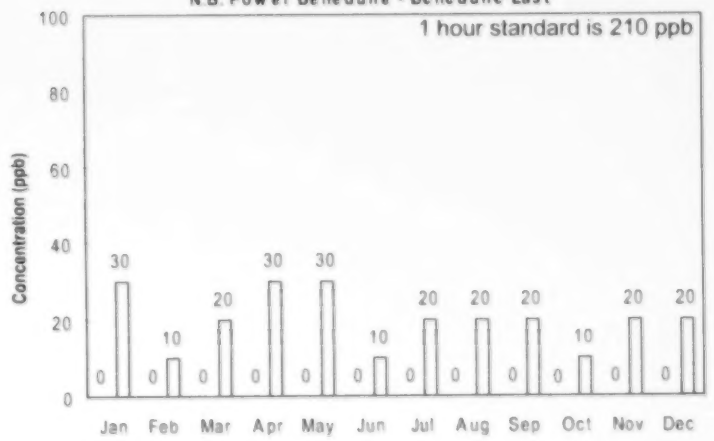
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

Highfield Street - Moncton



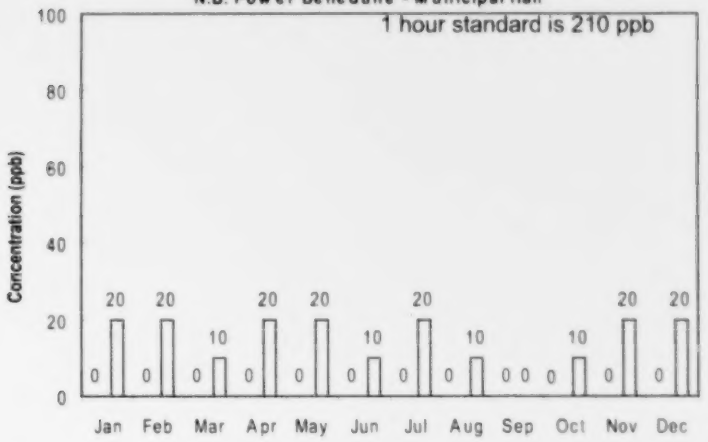
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

N.B. Power Belledune - Belledune East



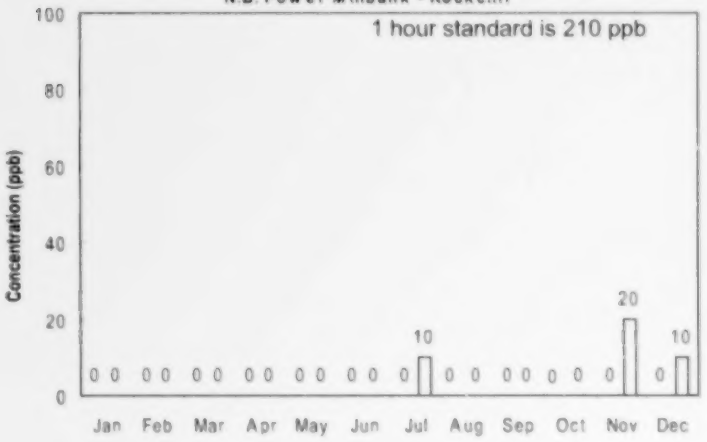
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

N.B. Power Belledune - Municipal Hall



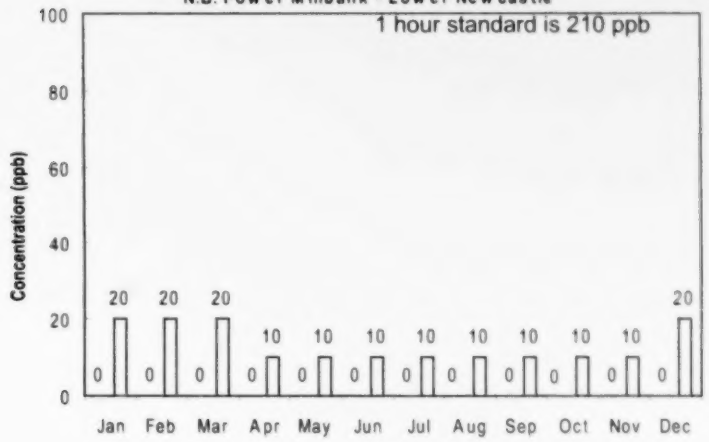
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

N.B. Power Millbank - Rockcliff



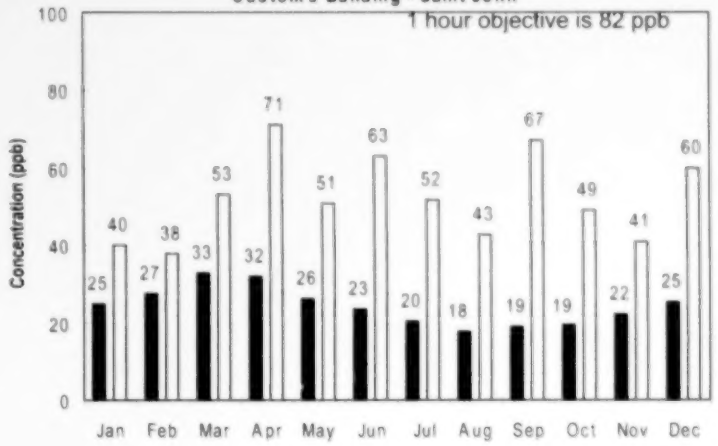
Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2007

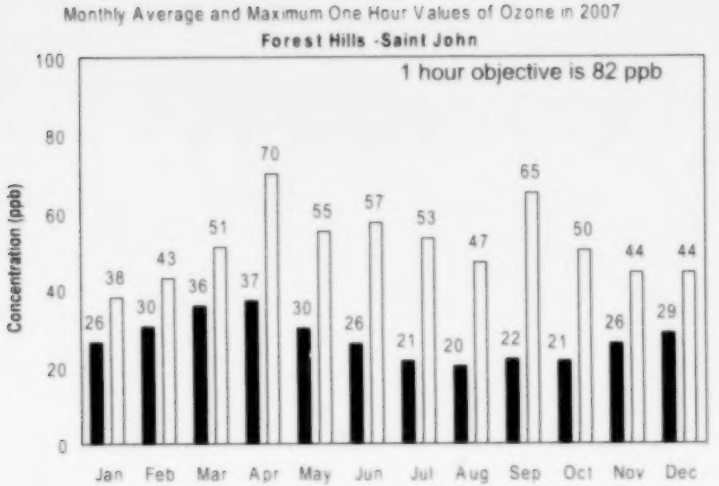
N.B. Power Millbank - Lower Newcastle

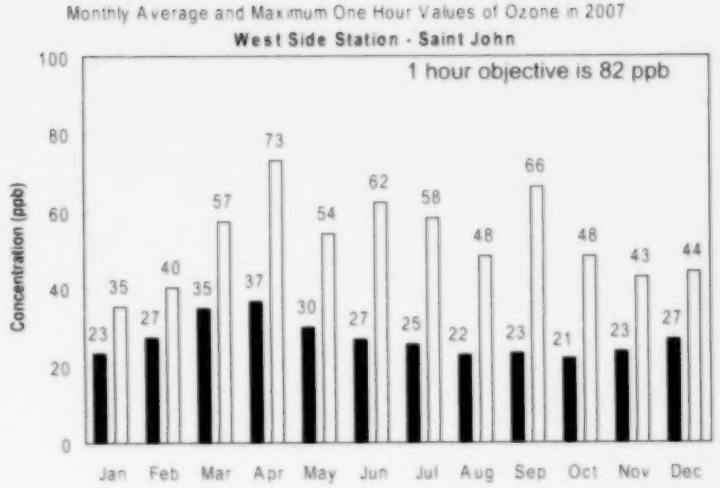


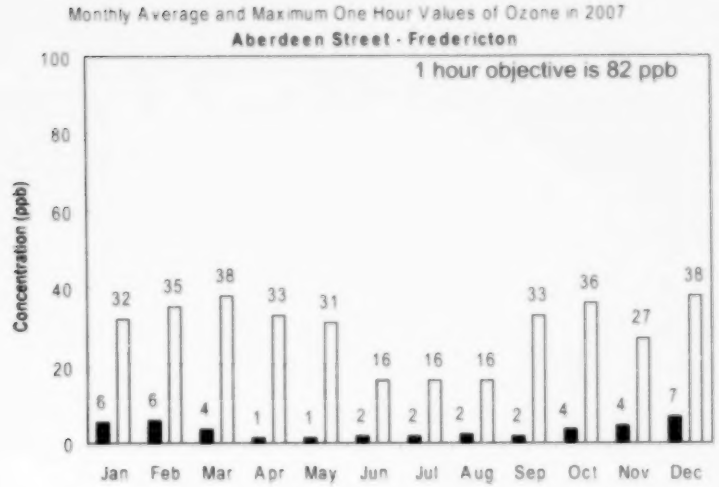
Monthly Average and Maximum One Hour Values of Ozone in 2007

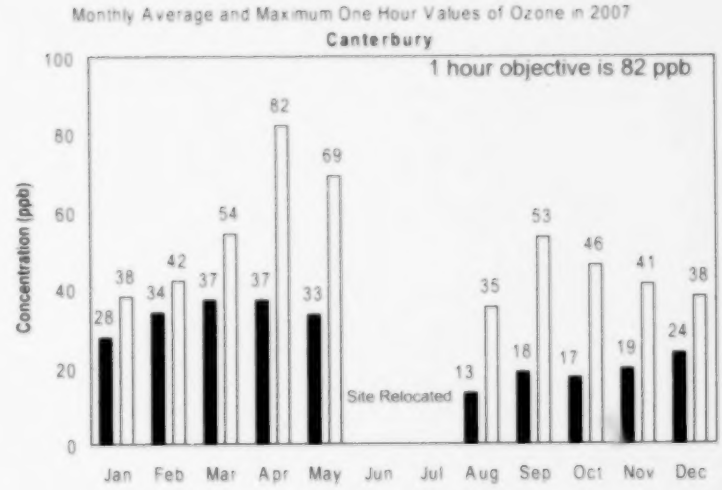
Customs Building - Saint John

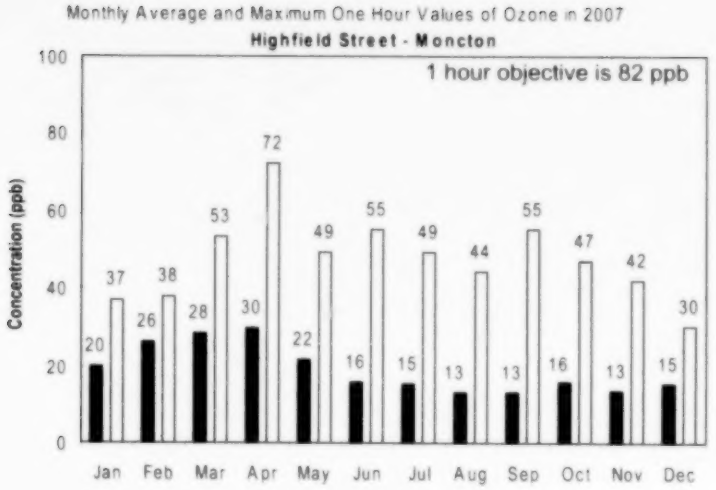


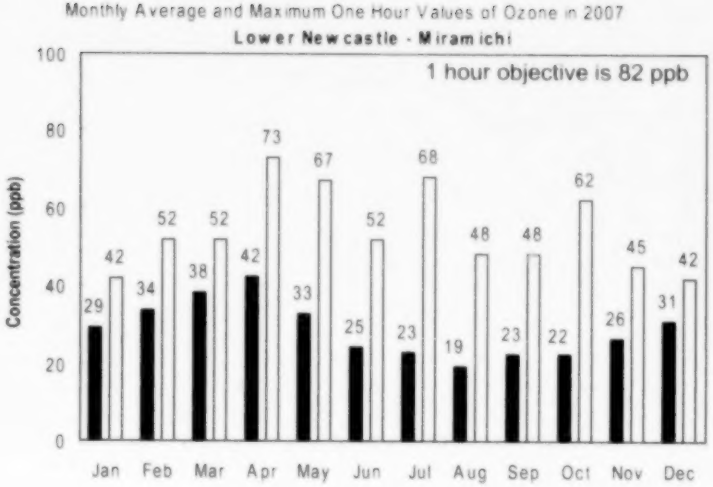

Monthly Average and Maximum One Hour Values of Ozone in 2007
Forest Hills -Saint John
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
26 38 30 43 36 51 37 70 30 55 26 57 21 53 20 47 22 65 21 50 26 44 29 44

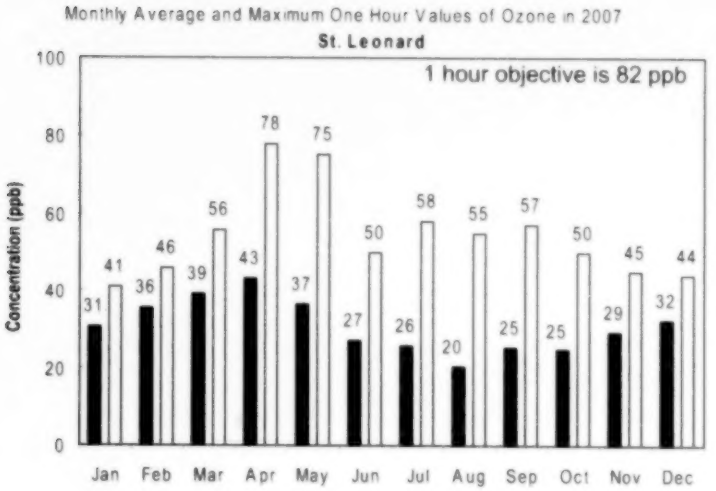

Monthly Average and Maximum One Hour Values of Ozone in 2007
West Side Station - Saint John
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
23 35 27 40 35 57 37 73 30 54 27 62 25 58 22 48 23 66 21 48 23 43 27 44

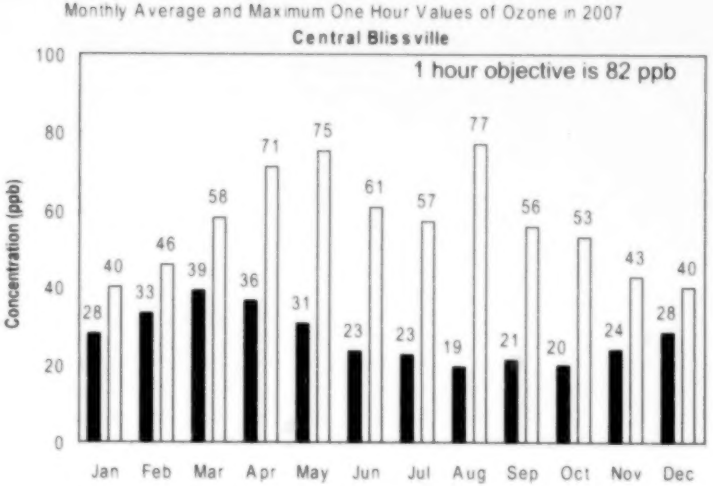

Monthly Average and Maximum One Hour Values of Ozone in 2007
Aberdeen Street - Fredericton
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
6 32 6 35 4 38 1 33 1 31 2 16 2 16 2 16 2 33 4 36 4 27 7 38

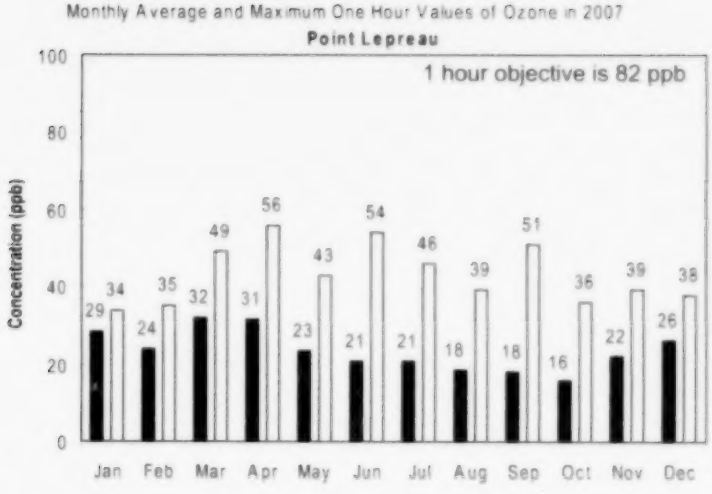

Monthly Average and Maximum One Hour Values of Ozone in 2007
Canterbury
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
28 38 34 42 37 54 37 82 33 69 Site Relocated 13 35 18 53 17 46 19 41 24 38

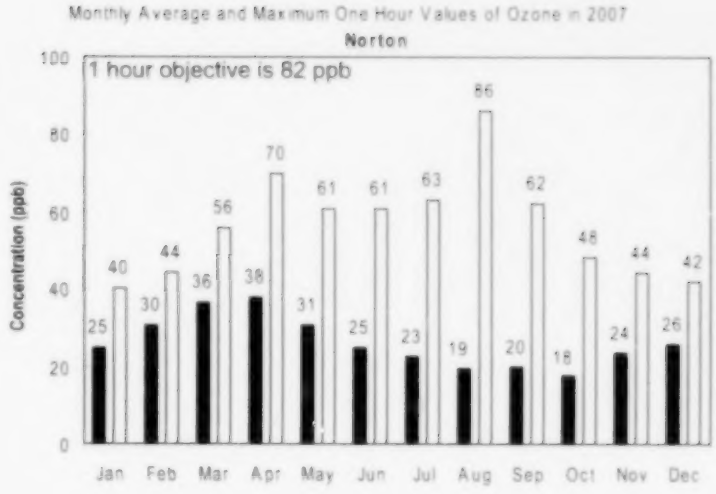

Monthly Average and Maximum One Hour Values of Ozone in 2007
Highfield Street - Moncton
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan 20 37
Feb 26 38
Mar 28 53
Apr 30 72
May 22 49
Jun 16 55
Jul 15 49
Aug 13 44
Sep 13 55
Oct 16 47
Nov 13 42
Dec 15 30

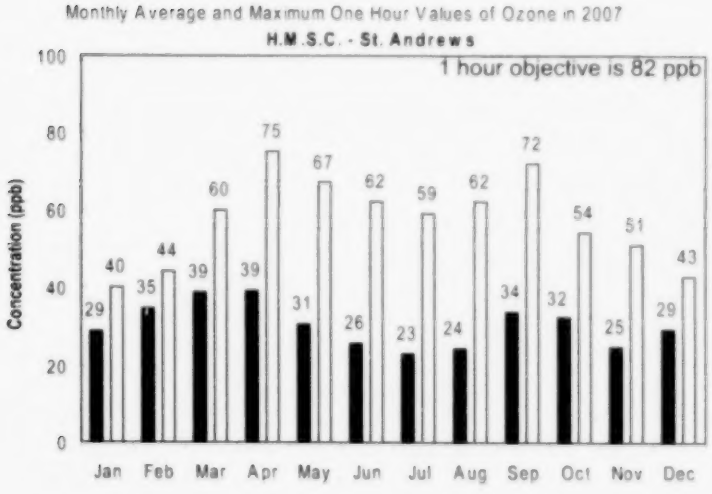

Monthly Average and Maximum One Hour Values of Ozone in 2007
Lower Newcastle - Miramichi
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan 29 42
Feb 34 52
Mar 38 52
Apr 42 73
May 33 67
Jun 25 52
Jul 23 68
Aug 19 48
Sep 23 48
Oct 22 62
Nov 26 45
Dec 31 42

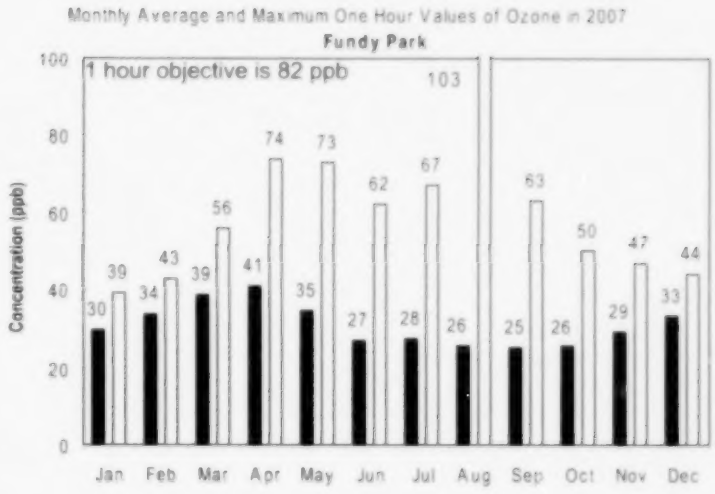

Monthly Average and Maximum One Hour Values of Ozone in 2007
St. Leonard
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan 31 41
Feb 36 46
Mar 39 56
Apr 43 78
May 37 75
Jun 27 50
Jul 26 58
Aug 20 55
Sep 25 57
Oct 25 50
Nov 29 45
Dec 32 44

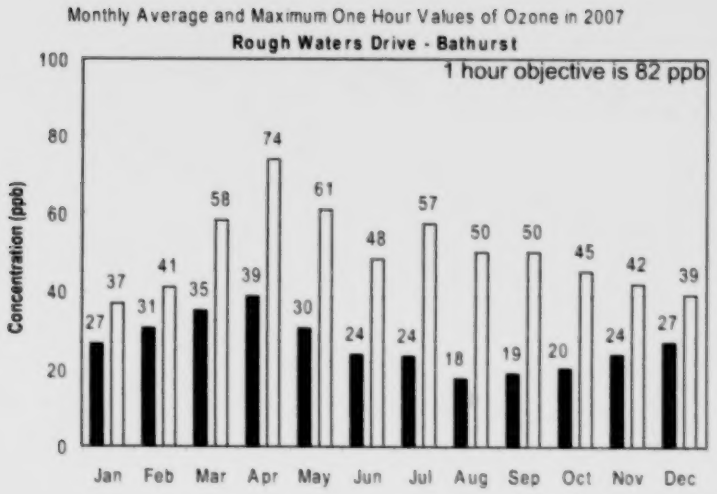

Monthly Average and Maximum One Hour Values of Ozone in 2007
Central Blissville
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan 28 40
Feb 33 46
Mar 39 58
Apr 36 71
May 31 75
Jun 23 61
Jul 23 57
Aug 19 77
Sep 21 56
Oct 20 53
Nov 24 43
Dec 28 40

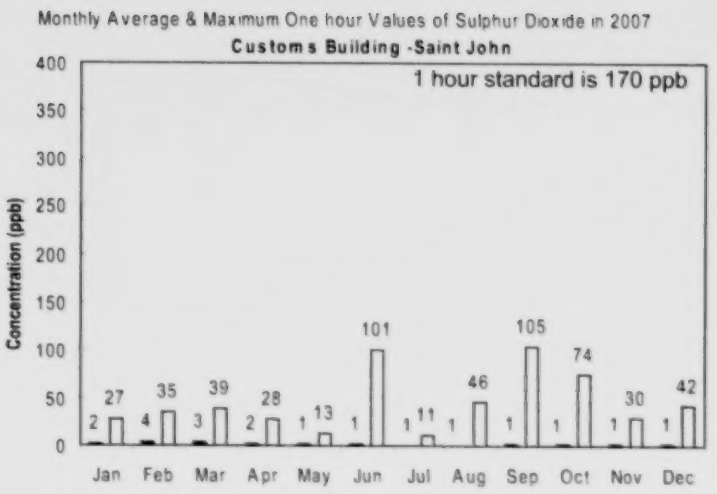

Monthly Average and Maximum One Hour Values of Ozone in 2007
Point Lepreau
1 hour objective is 82 ppb
Concentration (ppb)
Jan 29 34
Feb 24 35
Mar 32 49
Apr 31 56
May 23 43
Jun 21 54
Jul 21 46
Aug 18 39
Sep 18 51
Oct 16 36
Nov 22 39
Dec 26 38

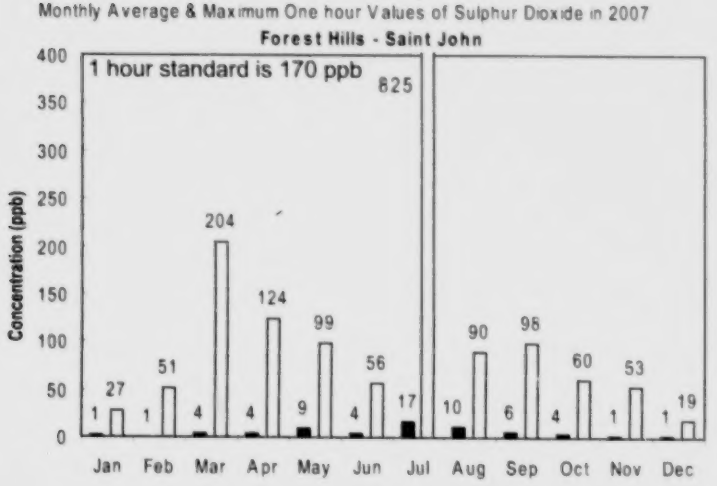

Monthly Average and Maximum One Hour Values of Ozone in 2007
Norton
1 hour objective is 82 ppb
Concentration (ppb)
Jan 25 40
Feb 30 44
Mar 36 56
Apr 38 70
May 31 61
Jun 25 61
Jul 23 63
Aug 19 86
Sep 20 62
Oct 18 48
Nov 24 44
Dec 26 42

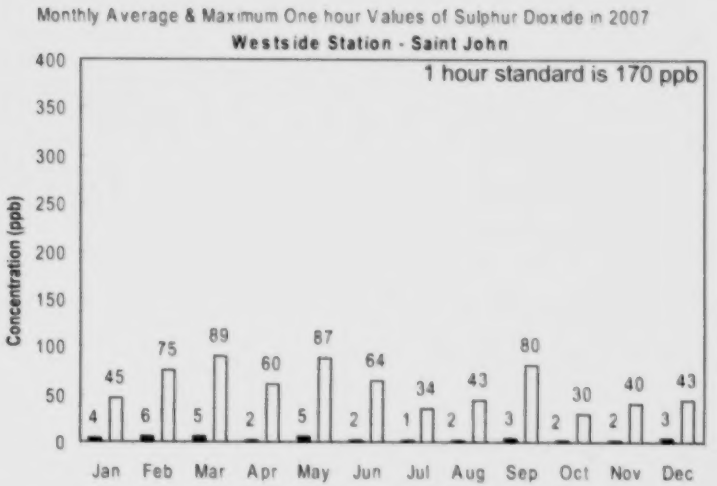

Monthly Average and Maximum One Hour Values of Ozone in 2007
H.M.S.C. - St. Andrews
1 hour objective is 82 ppb
Concentration (ppb)
Jan 29 40
Feb 35 44
Mar 39 60
Apr 39 75
May 31 67
Jun 26 62
Jul 23 59
Aug 24 62
Sep 34 72
Oct 32 54
Nov 25 51
Dec 29 43

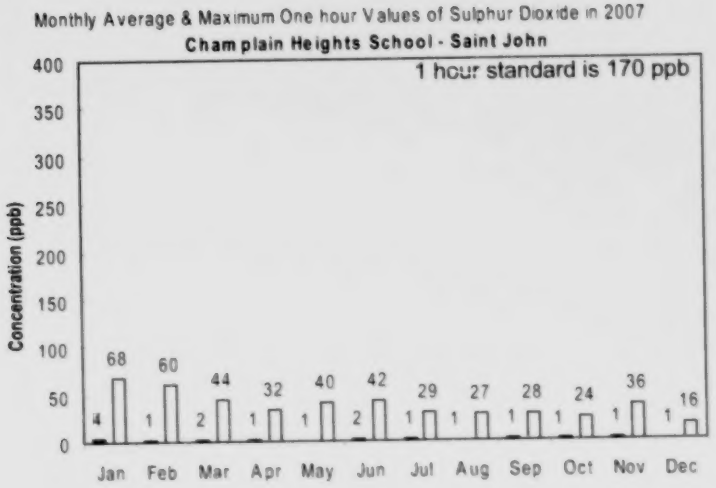

Monthly Average and Maximum One Hour Values of Ozone in 2007
Fundy Park
1 hour objective is 82 ppb
103
Concentration (ppb)
Jan 30 39
Feb 34 43
Mar 39 56
Apr 41 74
May 35 73
Jun 27 62
Jul 28 67
Aug 26
Sep 25 63
Oct 26 50
Nov 29 47
Dec 33 44

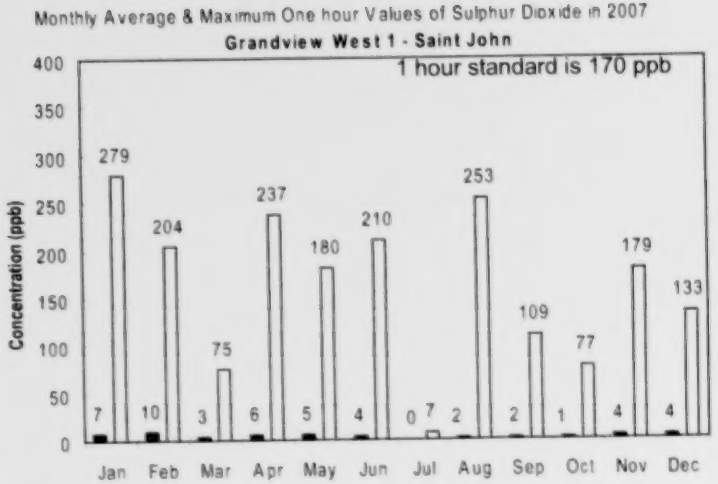

Monthly Average and Maximum One Hour Values of Ozone in 2007
Rough Waters Drive - Bathurst
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
27 37 31 41 35 58 39 74 30 61 24 48 24 57 18 50 19 50 20 45 24 42 27 39

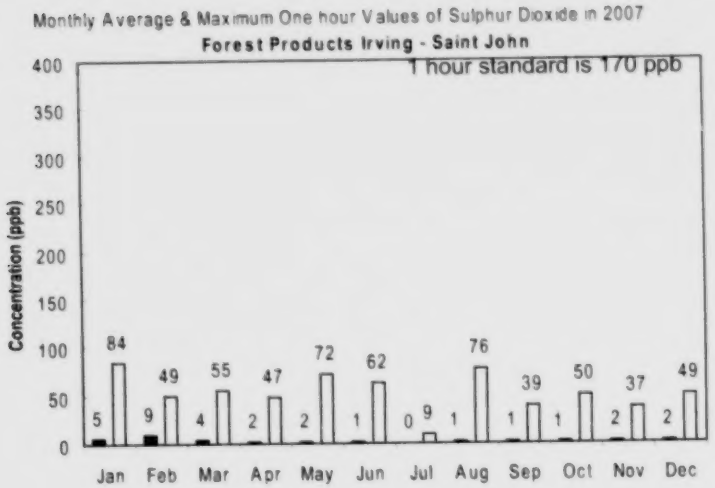

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Customs Building -Saint John
1 hour standard is 170 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 27 4 35 3 39 2 28 1 13 1 101 1 11 1 46 1 105 1 74 1 30 1 42

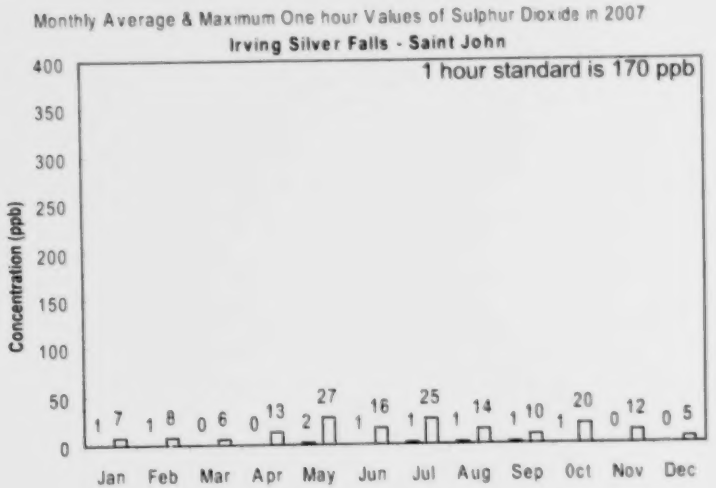

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Forest Hills - Saint John
1 hour standard is 170 ppb
825
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1 27 1 51 4 204 4 124 9 99 4 56 17 10 90 6 98 4 60 1 53 1 19


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Westside Station - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4 45 6 75 5 89 2 60 5 87 2 64 1 34 2 43 3 80 2 30 2 40 3 43


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Champlain Heights School - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
4 68
1 60
2 44
1 32
1 40
2 42
1 29
1 27
1 28
1 24
1 36
1 16
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

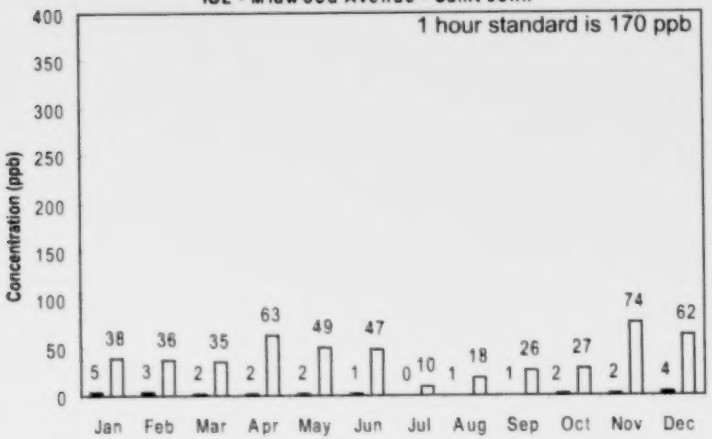

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Grandview West 1 - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
7 279
10 204
3 75
6 237
5 180
4 210
0 7
2 253
2 109
1 77
4 179
4 133
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Forest Products Irving - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
5 84
9 49
4 55
2 47
2 72
1 62
0 9
1 76
1 39
1 50
2 37
2 49
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Irving Silver Falls - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
1 7
1 8
0 6
0 13
2 27
1 16
1 25
1 14
1 10
1 20
0 12
0 5
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

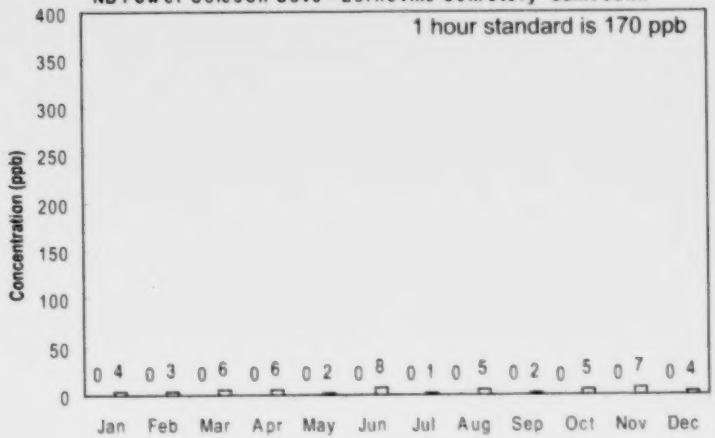
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

IOL - Midwood Avenue - Saint John



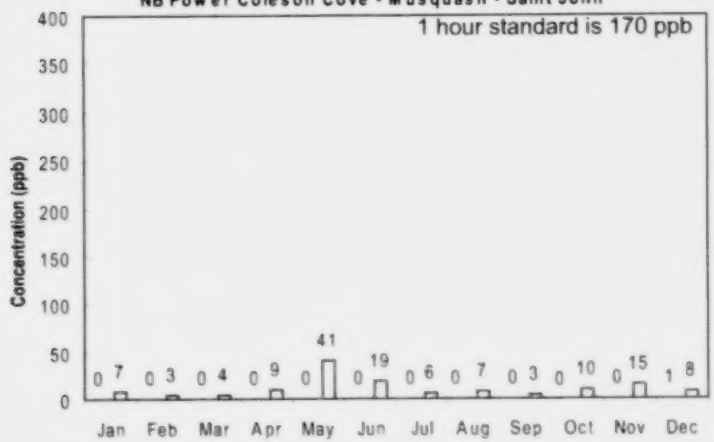
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

NB Power Coleson Cove - Lorneville Cemetery -Saint John



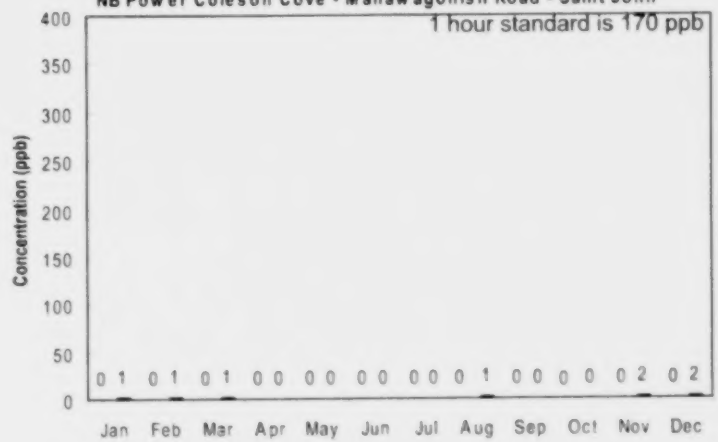
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

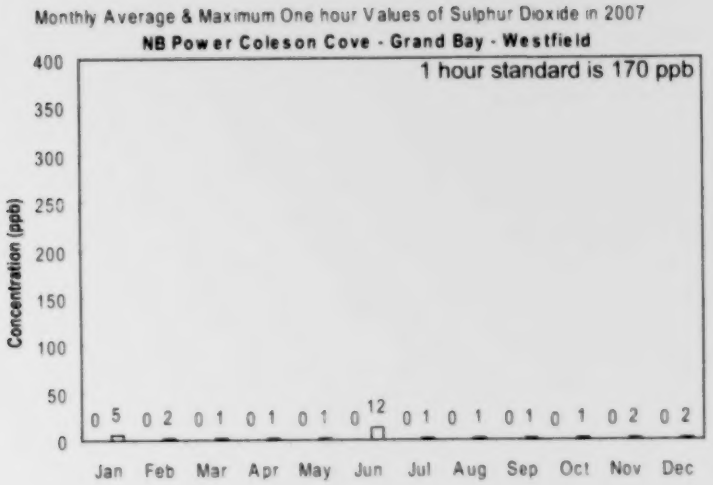
NB Power Coleson Cove - Musquash - Saint John

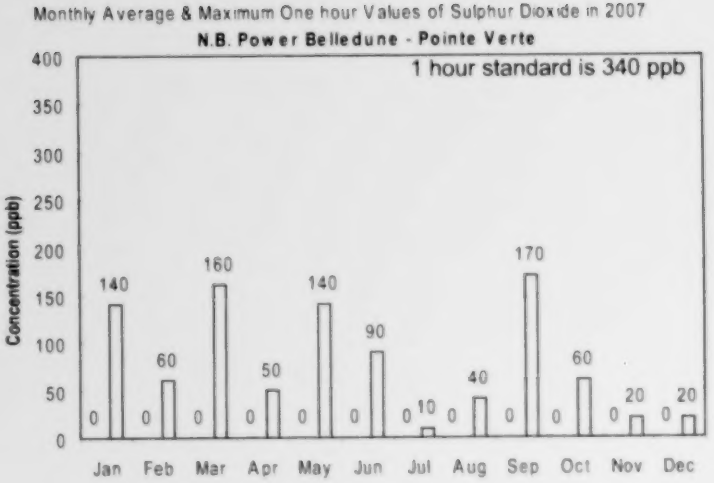


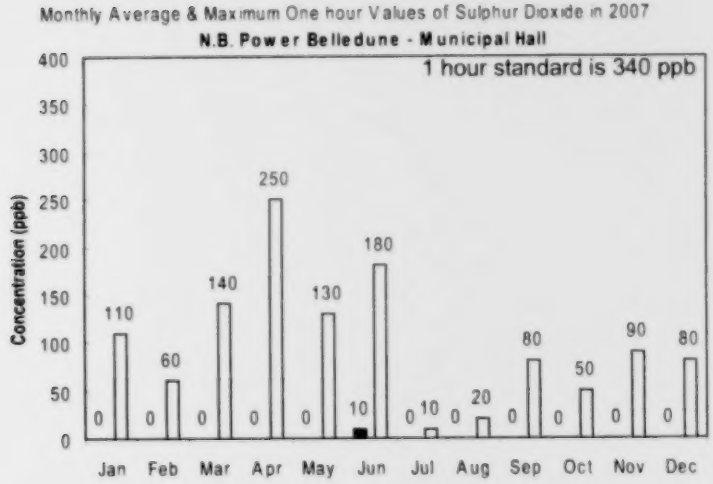
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

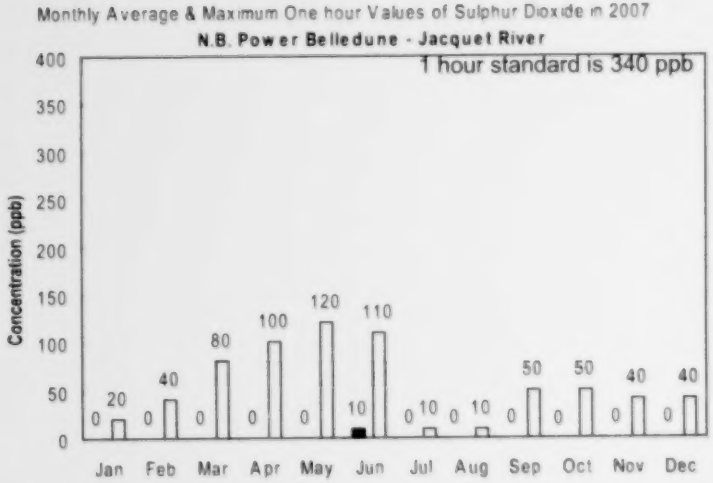
NB Power Coleson Cove - Manawagonish Road - Saint John

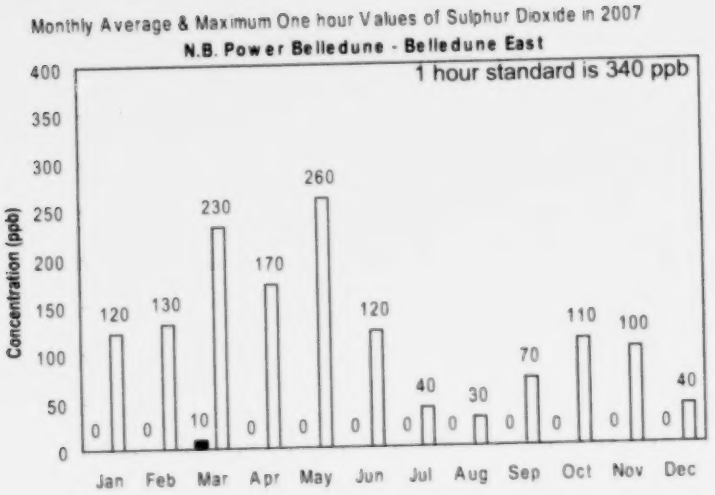


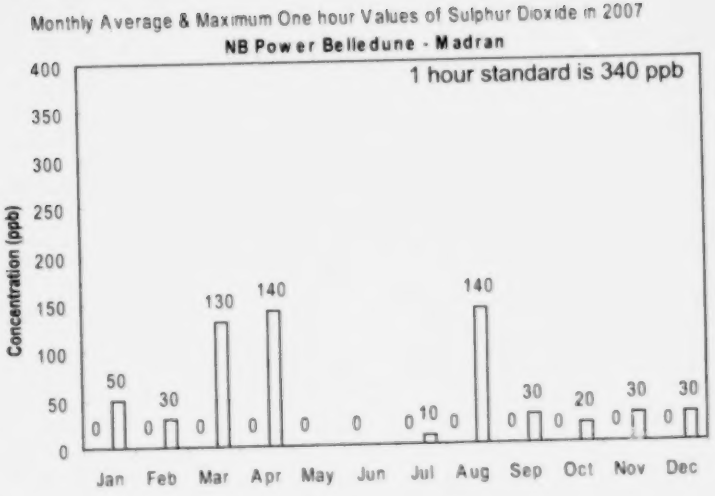

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
NB Power Coleson Cove - Grand Bay - Westfield
1 hour standard is 170 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 5 0 2 0 1 0 1 0 1 0 12 0 1 0 1 0 1 0 1 0 2 0 2
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

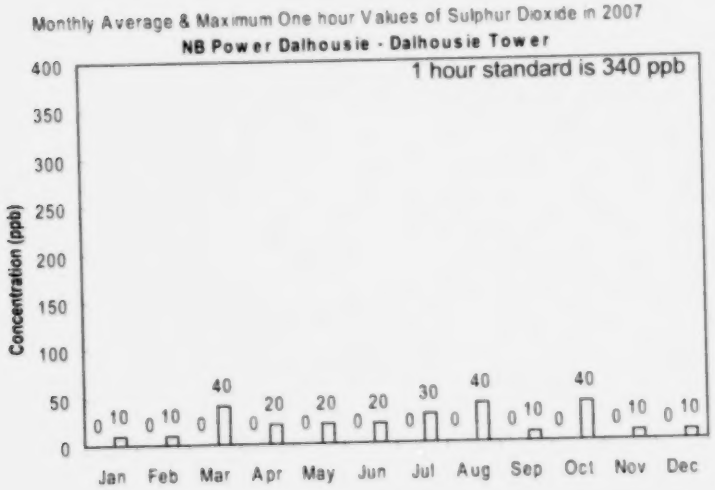

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
N.B. Power Belledune - Pointe Verte
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 140 0 60 0 160 0 50 0 140 0 90 0 10 0 40 0 170 0 60 0 20 0 20
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

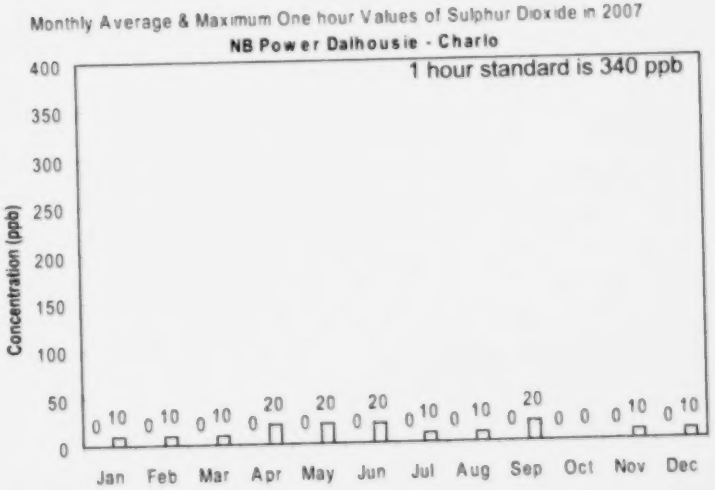

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
N.B. Power Belledune - Municipal Hall
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 110 0 60 0 140 0 250 0 130 10 180 0 10 0 20 0 80 0 50 0 90 0 80
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
N.B. Power Belledune - Jacquet River
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 20 0 40 0 80 0 100 0 120 10 110 0 10 0 10 0 50 0 50 0 40 0 40
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
N.B. Power Belledune - Belledune East
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 120 0 130 10 230 0 170 0 260 0 120 0 40 0 30 0 70 0 110 0 100 0 40
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

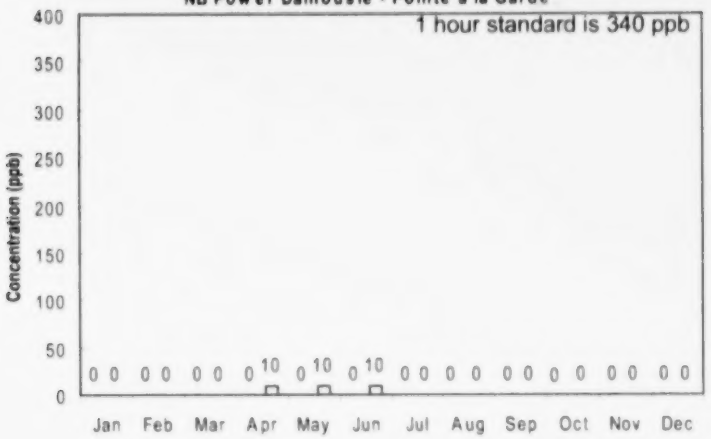

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
NB Power Belledune - Madran
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 50 0 30 0 130 0 140 0 0 0 10 0 140 0 30 0 20 0 30 0 30
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
NB Power Dalhousie - Dalhousie Tower
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 10 0 10 0 40 0 20 0 20 0 20 0 30 0 40 0 10 0 40 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
NB Power Dalhousie - Charlo
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 10 0 10 0 10 0 20 0 20 0 20 0 10 0 10 0 20 0 0 0 10 0 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

NB Power Dalhousie - Pointe à la Garde

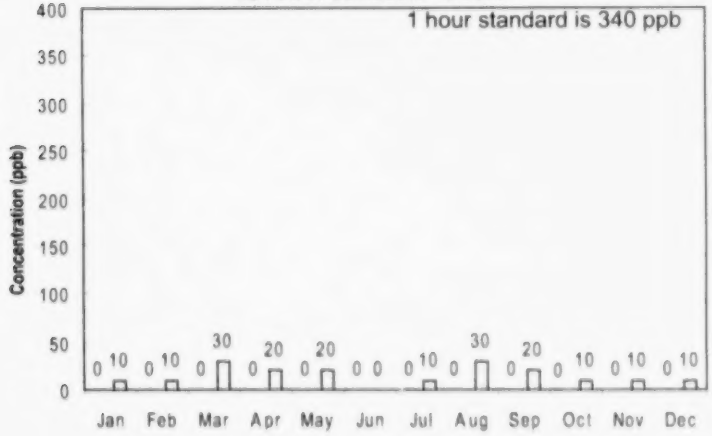


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

NB Power Dalhousie - Bayview

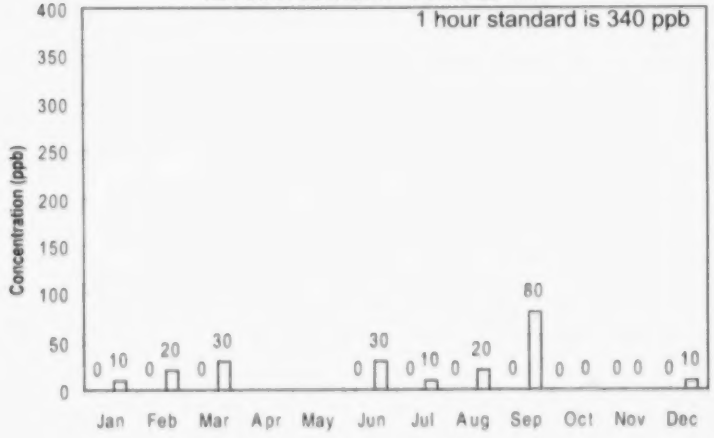
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

NB Power Dalhousie - Mobile

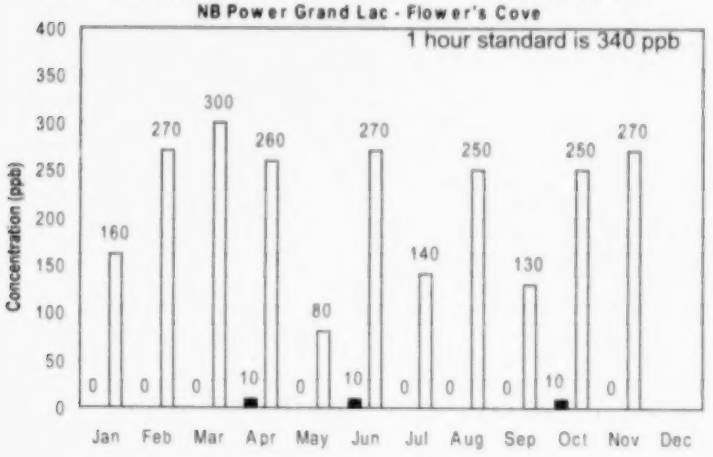


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

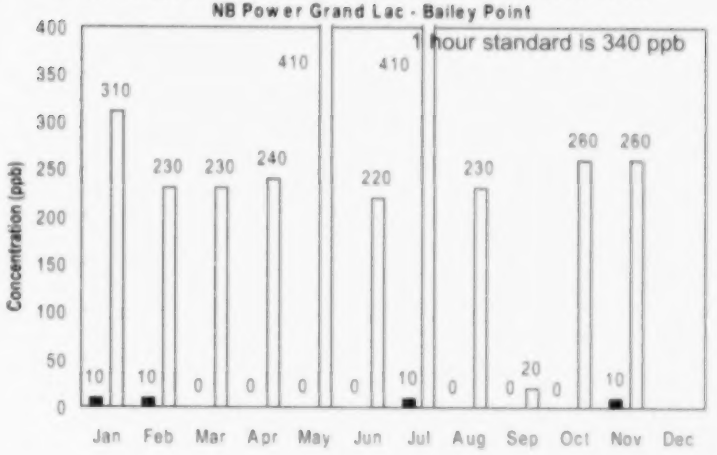
NB Power Dalhousie - Pointe La Nim



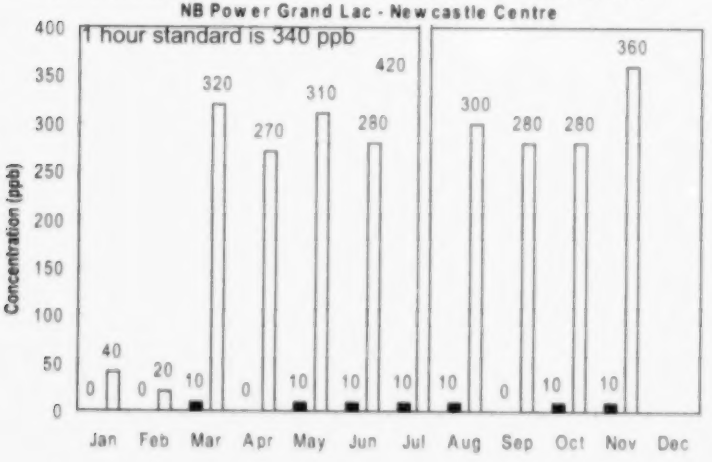
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007



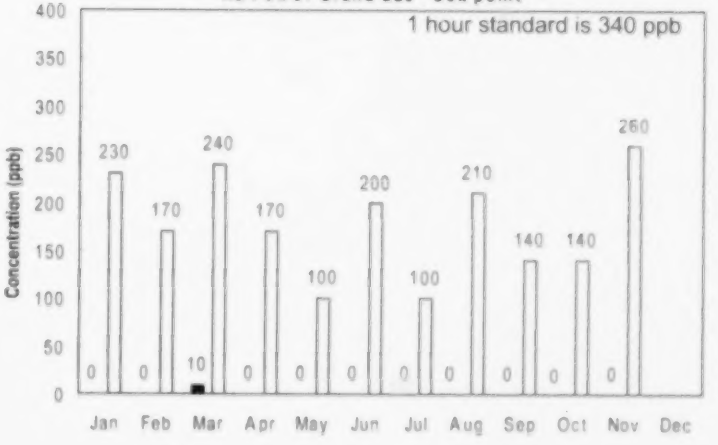
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

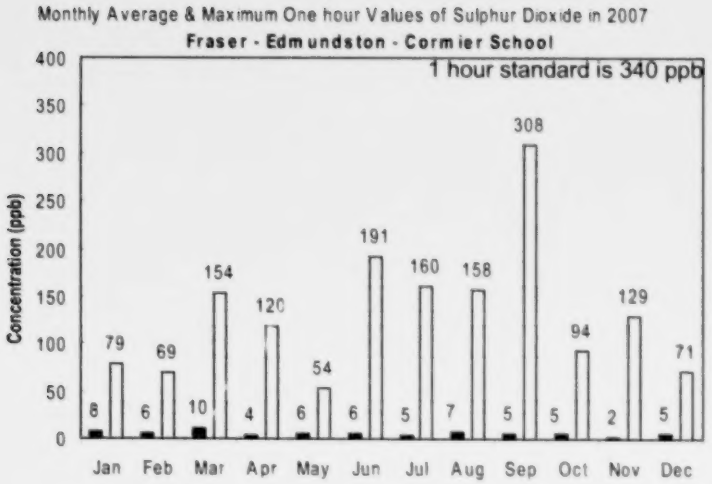


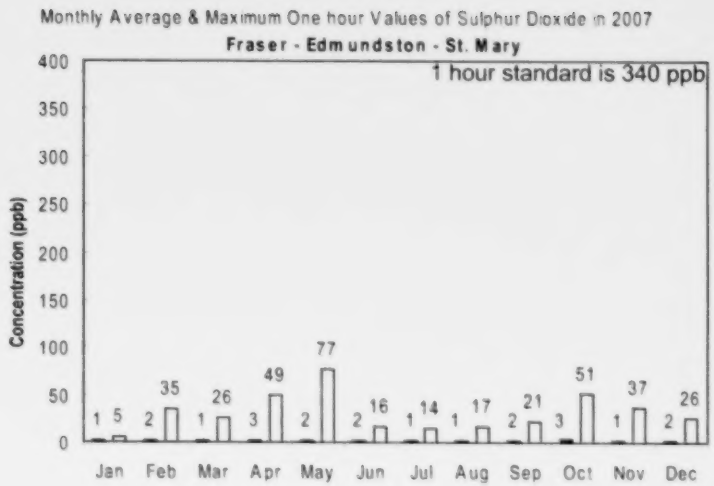
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

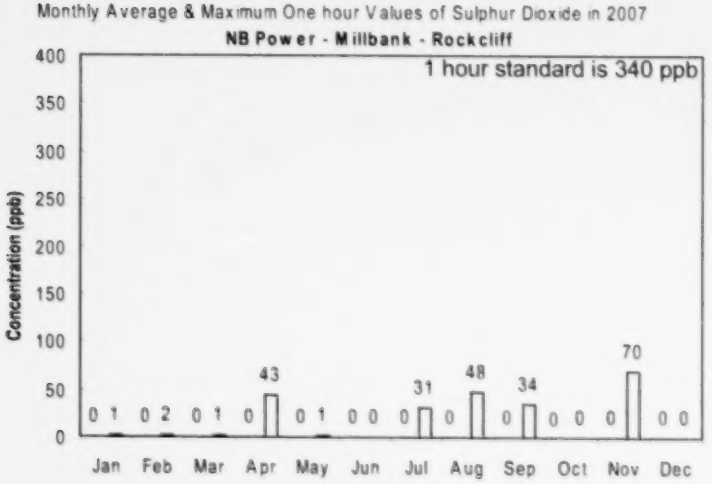


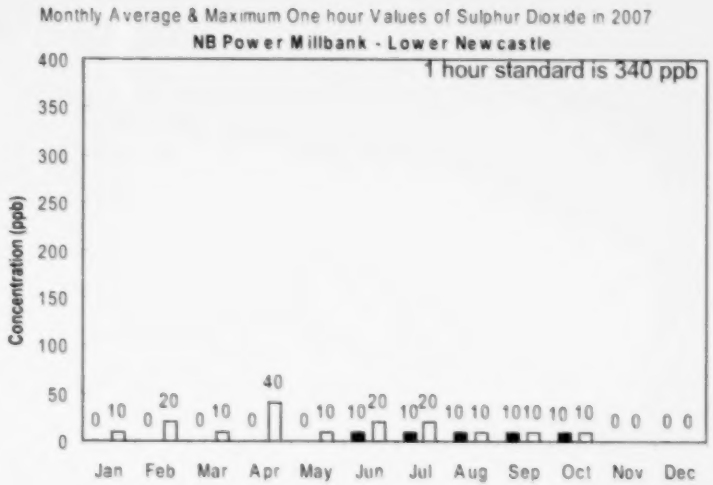
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007




Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Fraser - Edmundston - Cormier School
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
8 79 6 69 10 154 4 120 6 54 6 191 5 160 7 158 5 308 5 94 2 129 5 71
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

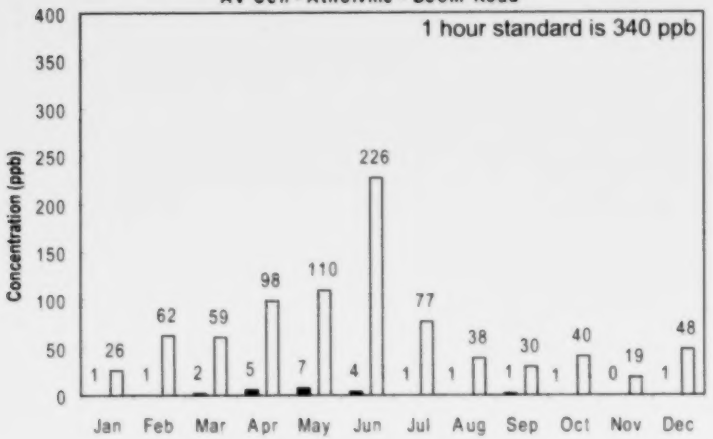

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
Fraser - Edmundston - St. Mary
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
1 5 2 35 1 26 3 49 2 77 2 16 1 14 1 17 2 21 3 51 1 37 2 26
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
NB Power - Millbank - Rockcliff
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 1 0 2 0 1 0 43 0 1 0 0 0 31 0 48 0 34 0 0 0 70 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007
NB Power Millbank - Lower Newcastle
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 10 0 20 0 10 0 40 0 10 10 20 10 20 10 10 10 10 10 10 0 0 0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

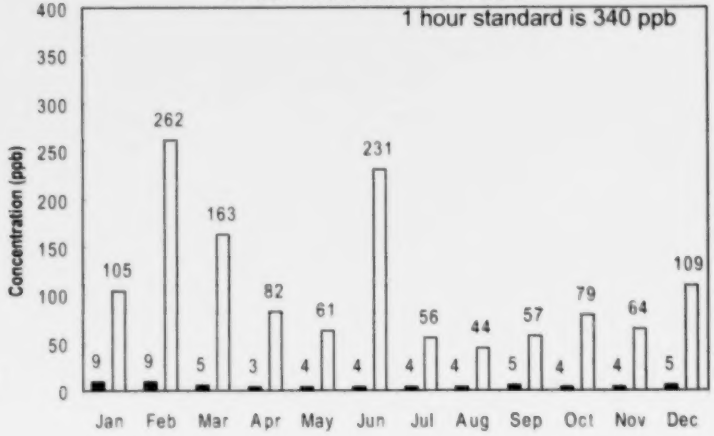
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

AV Cell - Atholville - Boom Road



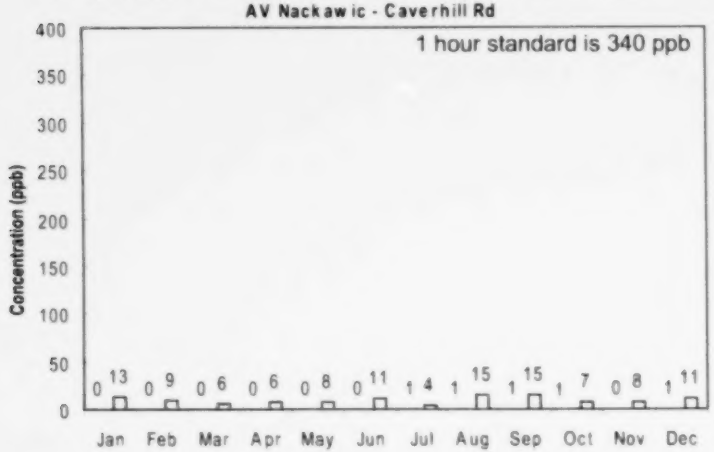
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

AV Cell - Atholville - Beauvista E



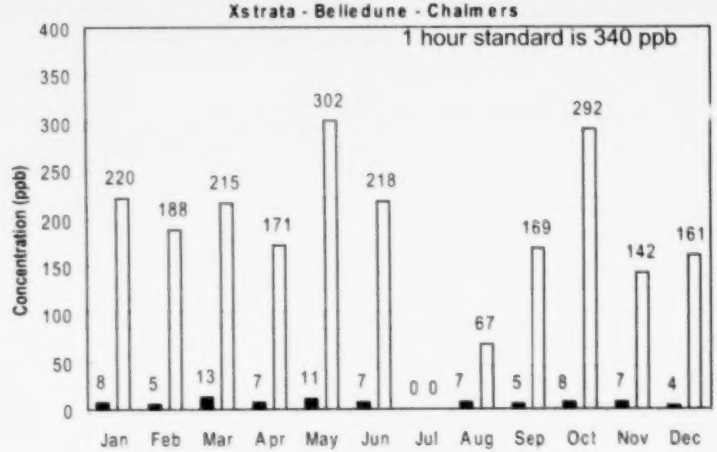
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

AV Nackawic - Caverhill Rd



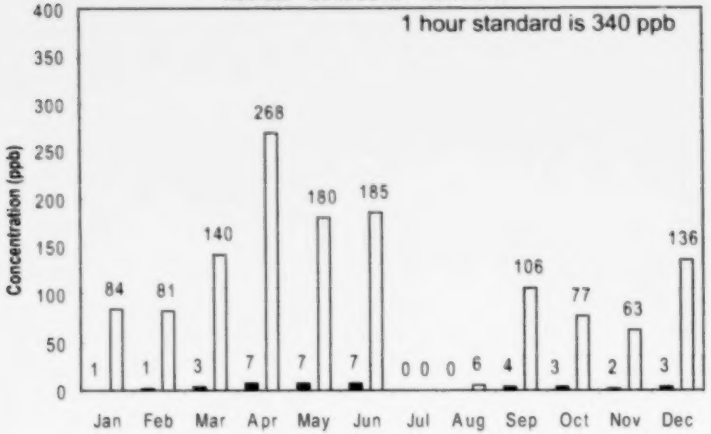
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

Xstrata - Belledune - Chalmers



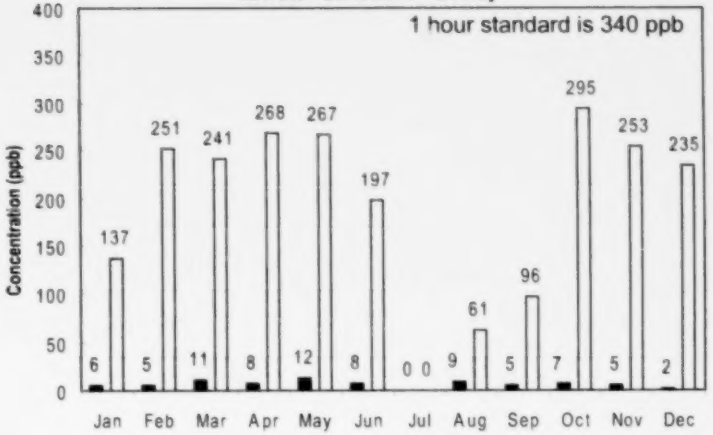
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

Xstrata - Belledune - Townsite



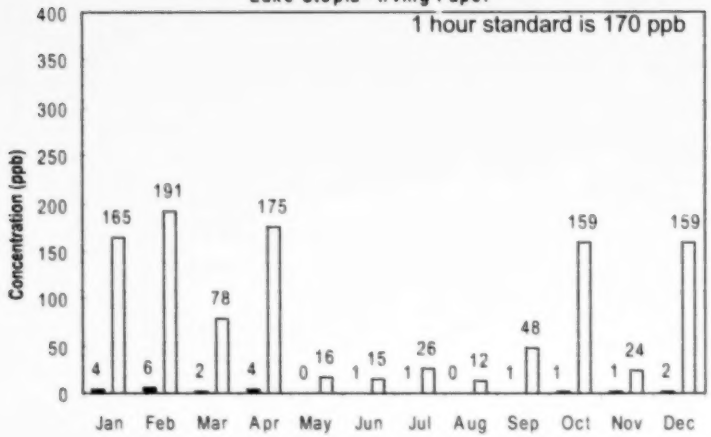
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

Xstrata - Belledune - Boulay



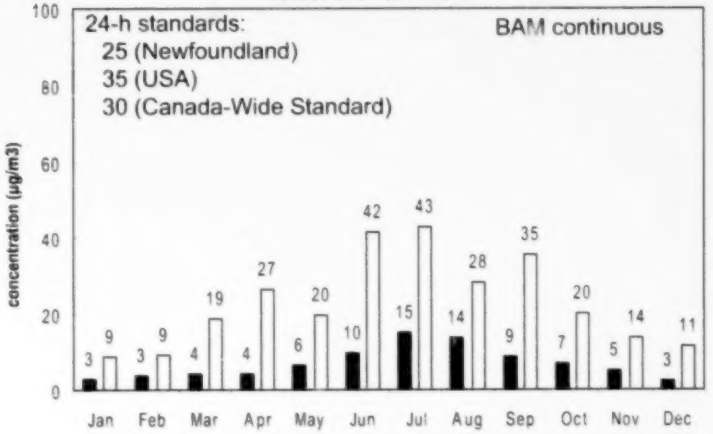
Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2007

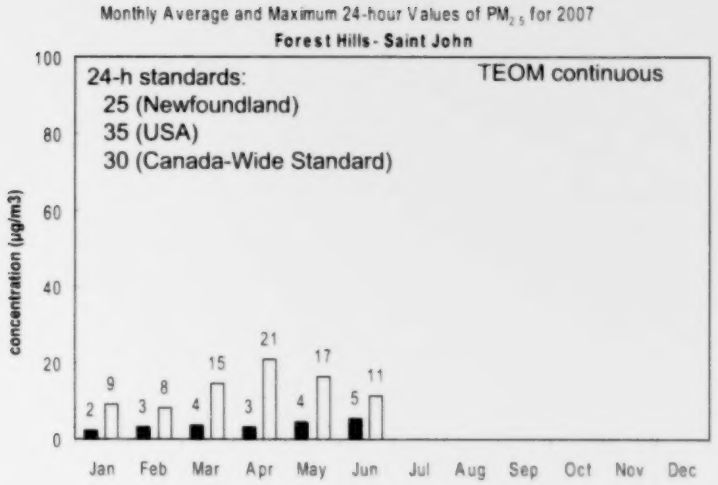
Lake Utopia - Irving Paper

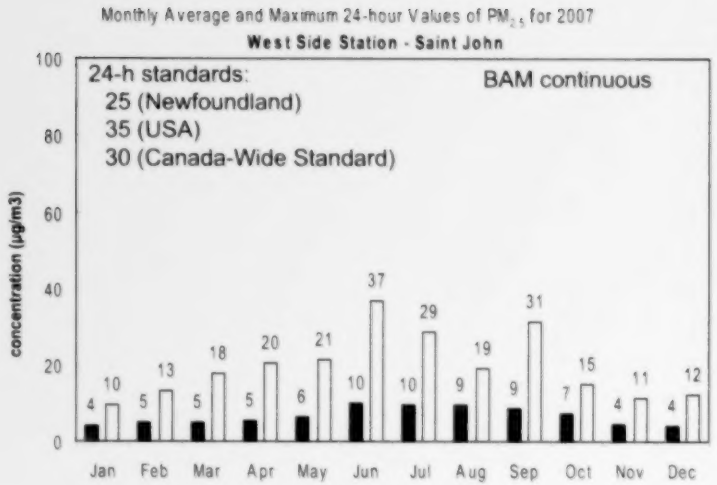


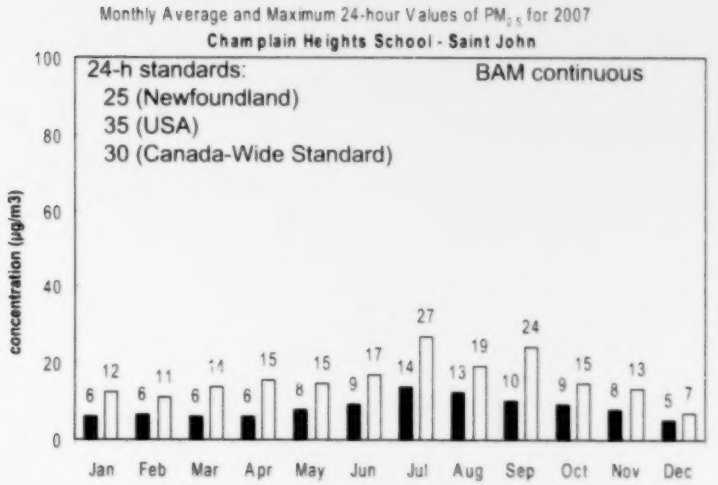
Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2007

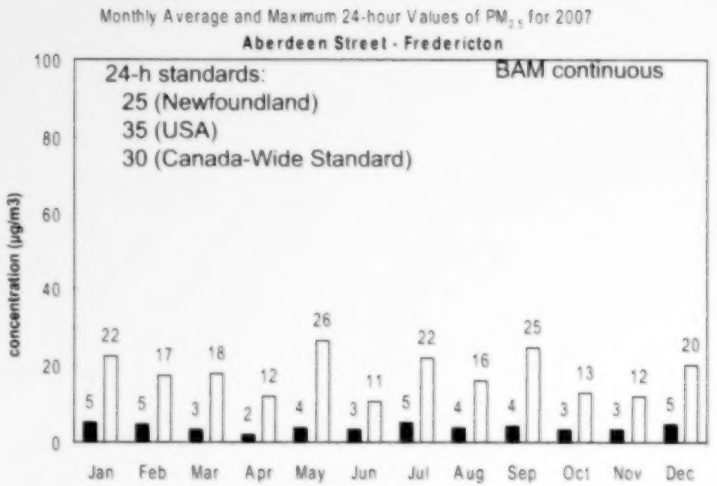
Forest Hills - Saint John

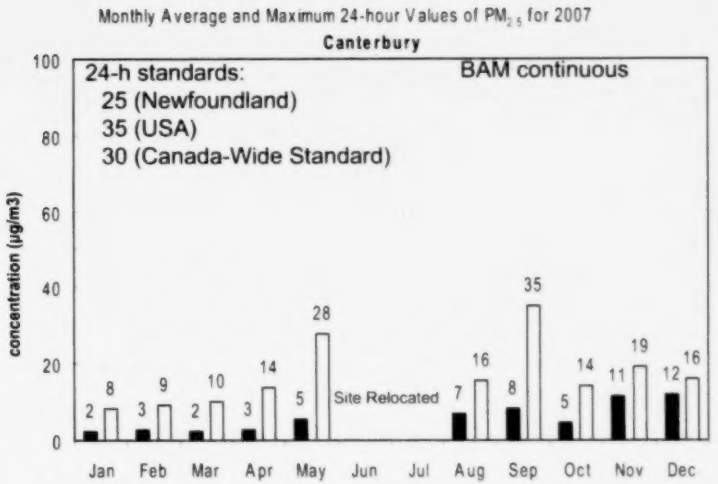


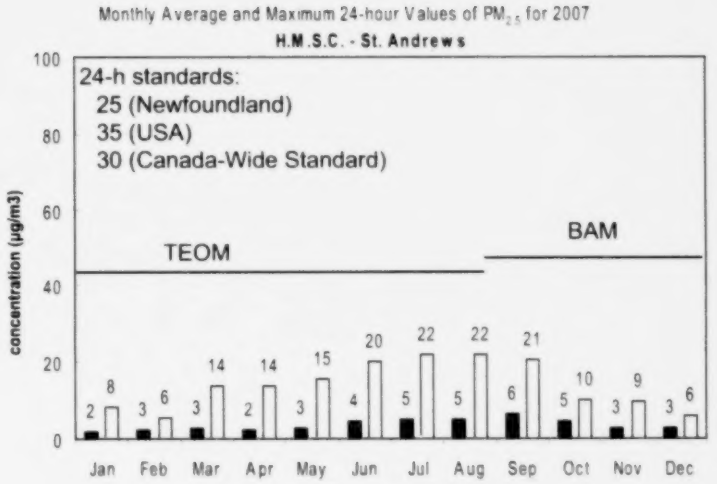

Monthly Average and Maximum 24-hour Values of PM2.5 for 2007
Forest Hills - Saint John
TEOM continuous
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
concentration (µg/m3)
0
20
40
60
80
100
Jan 2 9
Feb 3 8
Mar 4 15
Apr 3 21
May 4 17
Jun 5 11
Jul
Aug
Sep
Oct
Nov
Dec

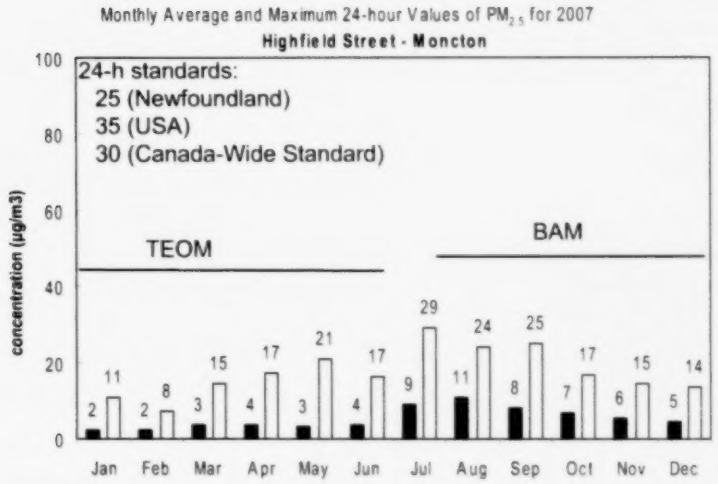

Monthly Average and Maximum 24-hour Values of PM2.5 for 2007
West Side Station - Saint John
BAM continuous
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
concentration (µg/m3)
0
20
40
60
80
100
Jan 4 10
Feb 5 13
Mar 5 18
Apr 5 20
May 6 21
Jun 10 37
Jul 10 29
Aug 9 19
Sep 9 31
Oct 7 15
Nov 4 11
Dec 4 12

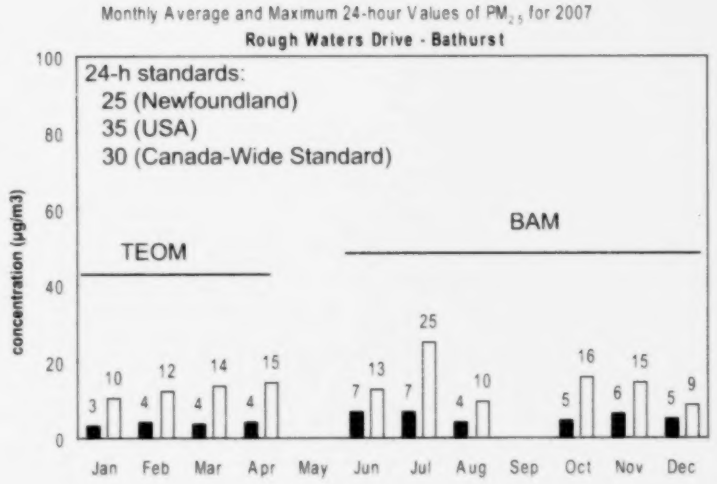

Monthly Average and Maximum 24-hour Values of PM2.5 for 2007
Champlain Heights School - Saint John
BAM continuous
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
concentration (µg/m3)
0
20
40
60
80
100
Jan 6 12
Feb 6 11
Mar 6 14
Apr 6 15
May 8 15
Jun 9 17
Jul 14 27
Aug 13 19
Sep 10 24
Oct 9 15
Nov 8 13
Dec 5 7

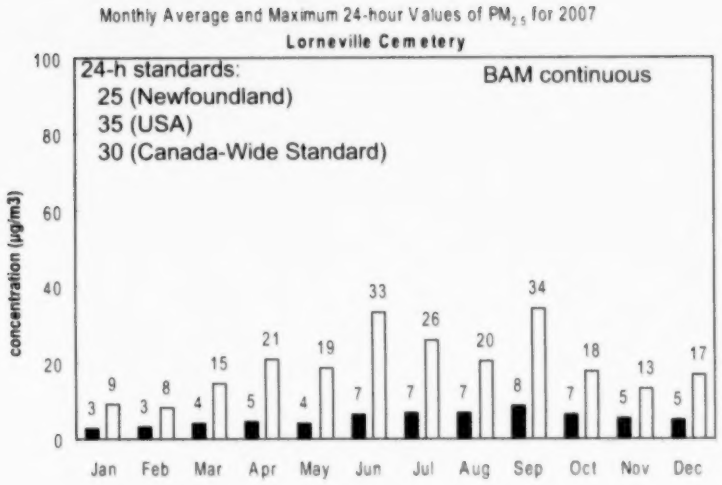

Monthly Average and Maximum 24-hour Values of PM2.5 for 2007
Aberdeen Street - Fredericton
BAM continuous
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
concentration (µg/m3)
0
20
40
60
80
100
Jan 5 22
Feb 5 17
Mar 3 18
Apr 2 12
May 4 26
Jun 3 11
Jul 5 22
Aug 4 16
Sep 4 25
Oct 3 13
Nov 3 12
Dec 5 20

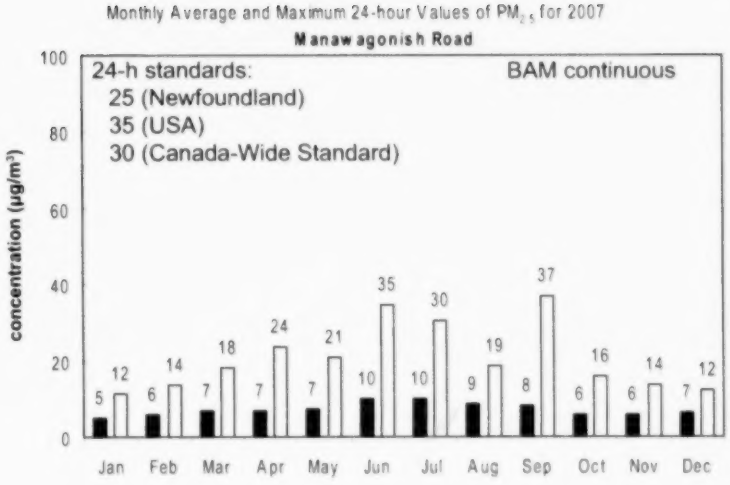

Monthly Average and Maximum 24-hour Values of PM2.5 for 2007
Canterbury
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
BAM continuous
Site Relocated
concentration (µg/m3)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 8 3 9 2 10 3 14 5 28 7 16 8 35 5 14 11 19 12 16

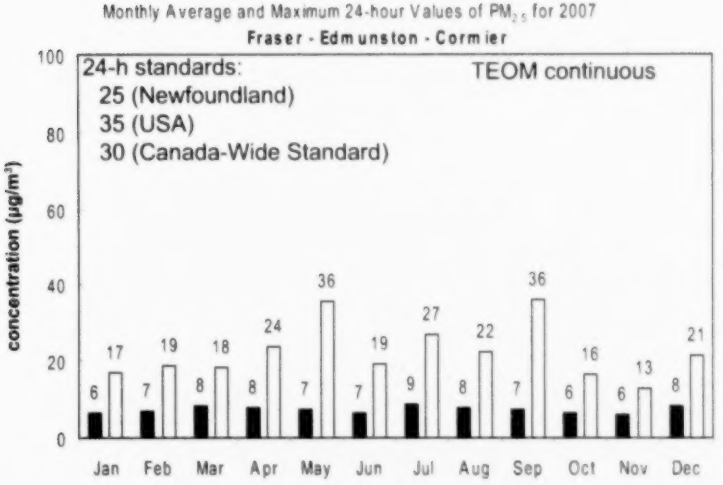

Monthly Average and Maximum 24-hour Values of PM2.5 for 2007
H.M.S.C. - St. Andrews
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
TEOM
BAM
concentration (µg/m3)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 8 3 6 3 14 2 14 3 15 4 20 5 22 5 22 6 21 5 10 3 9 3 6

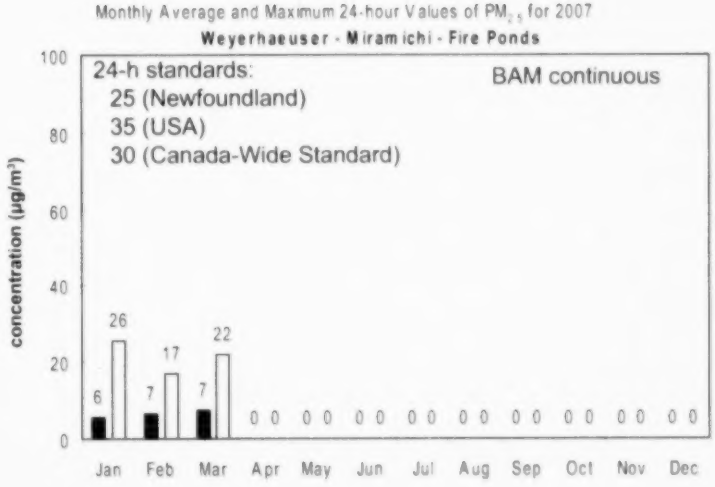

Monthly Average and Maximum 24-hour Values of PM2.5 for 2007
Highfield Street - Moncton
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
TEOM
BAM
concentration (µg/m3)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 11 2 8 3 15 4 17 3 21 4 17 9 29 11 24 8 25 7 17 6 15 5 14

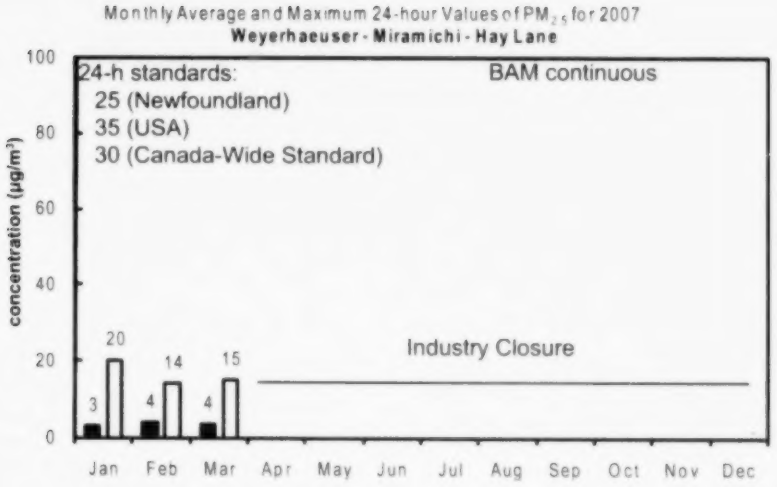

Monthly Average and Maximum 24-hour Values of PM2.5 for 2007
Rough Waters Drive - Bathurst
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
TEOM
BAM
concentration (µg/m3)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 10 4 12 4 14 4 15 7 13 7 25 4 10 5 16 6 15 5 9

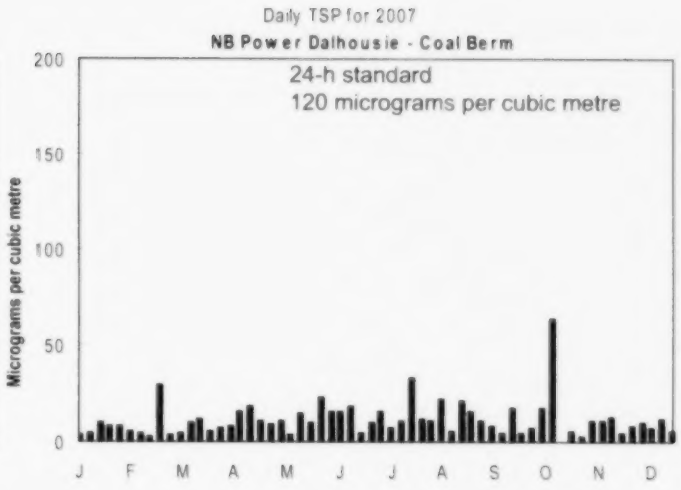

Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2007
Lorneville Cemetery
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
BAM continuous
concentration (µg/m3)
100
80
60
40
20
0
3 9
3 8
4 15
5 21
4 19
7 33
7 26
7 20
8 34
7 18
5 13
5 17
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

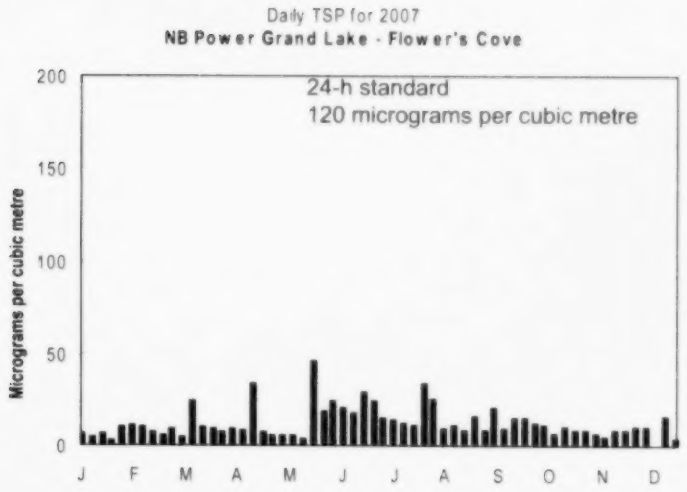

Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2007
Manawagonish Road
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
BAM continuous
concentration (µg/m³)
100
80
60
40
20
0
5 12
6 14
7 18
7 24
7 21
10 35
10 30
9 19
8 37
6 16
6 14
7 12
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

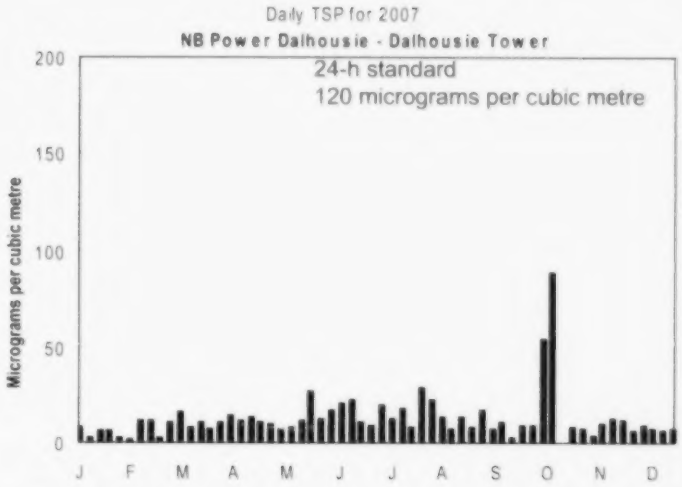

Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2007
Fraser - Edmunston - Cormier
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
TEOM continuous
concentration (µg/m³)
100
80
60
40
20
0
6 17
7 19
8 18
8 24
7 36
7 19
9 27
8 22
7 36
6 16
6 13
8 21
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

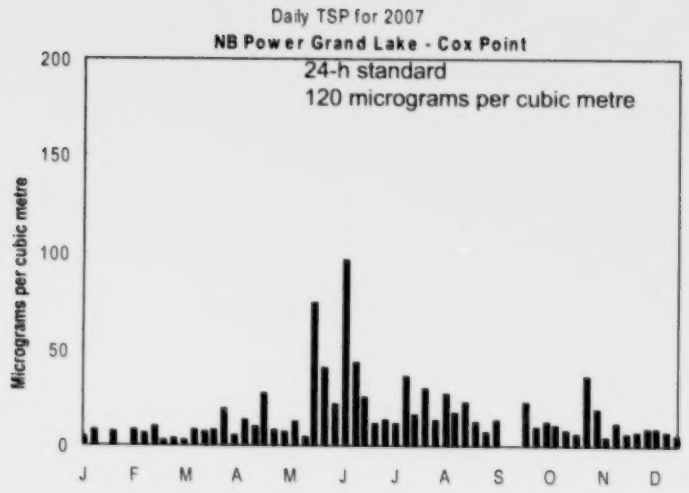

Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2007
Weyerhaeuser - Miramichi - Fire Ponds
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
BAM continuous
concentration (µg/m³)
100
80
60
40
20
0
6 26
7 17
7 22
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

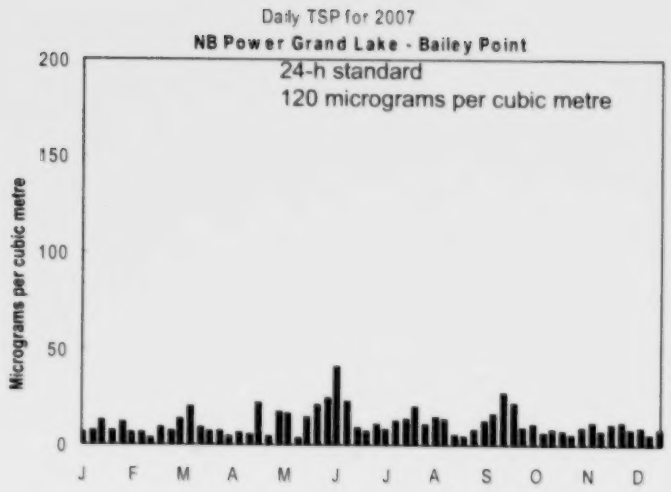

Monthly Average and Maximum 24-hour Values of $PM_{2.5}$ for 2007
Weyerhaeuser - Miramichi - Hay Lane
24-h standards:
25 (Newfoundland)
35 (USA)
30 (Canada-Wide Standard)
BAM continuous
Industry Closure
concentration (µg/m³)
100
80
60
40
20
0
3
20
4
14
4
15
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

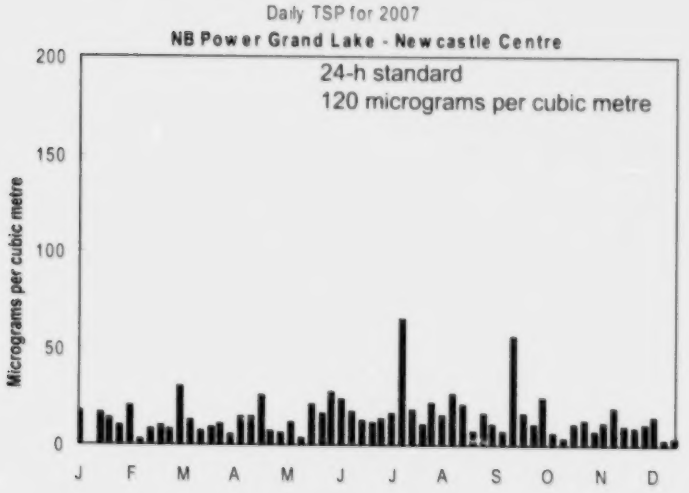

Daily TSP for 2007
NB Power Dalhousie - Coal Berm
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

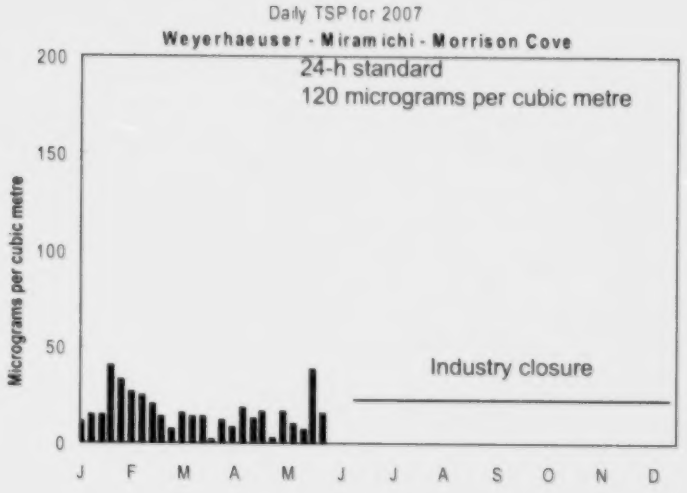

Daily TSP for 2007
NB Power Grand Lake - Flower's Cove
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

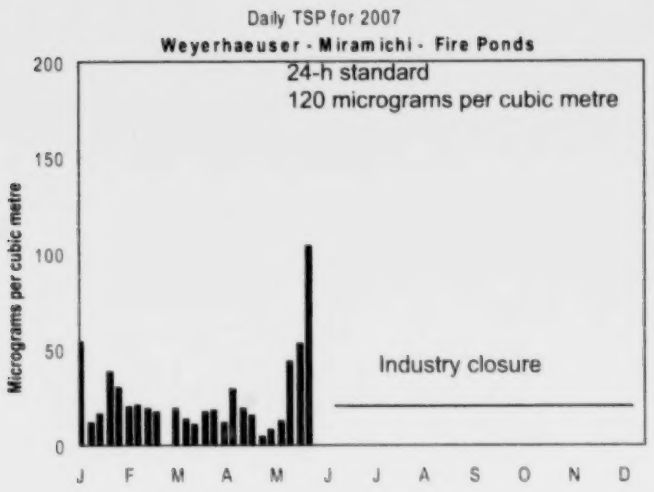

Daily TSP for 2007
NB Power Dalhousie - Dalhousie Tower
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

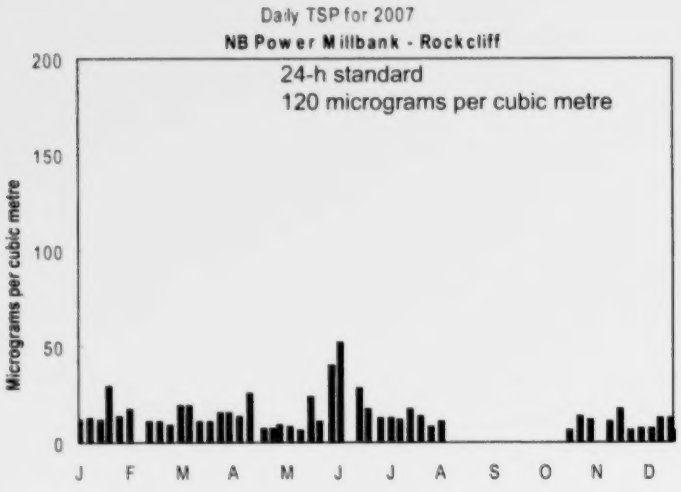

Daily TSP for 2007
NB Power Grand Lake - Cox Point
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

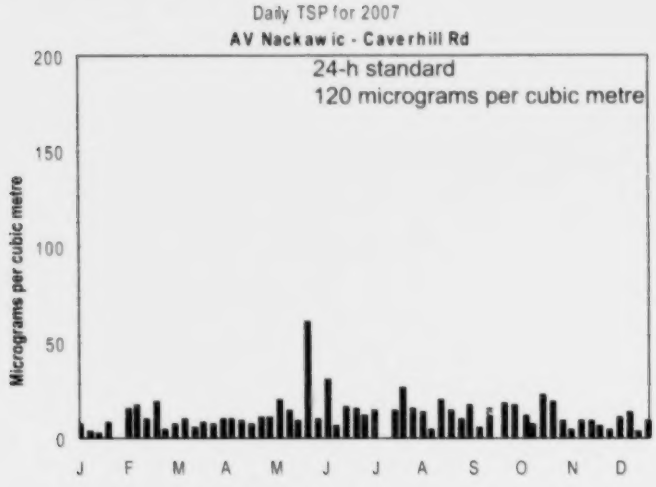

Daily TSP for 2007
NB Power Grand Lake - Bailey Point
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

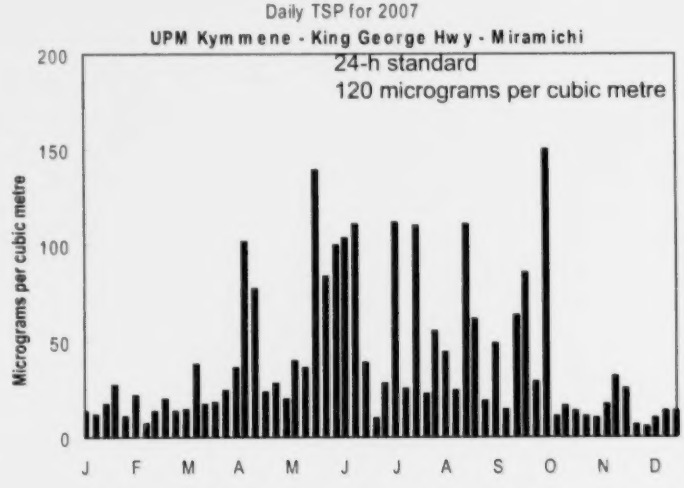

Daily TSP for 2007
NB Power Grand Lake - Newcastle Centre
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

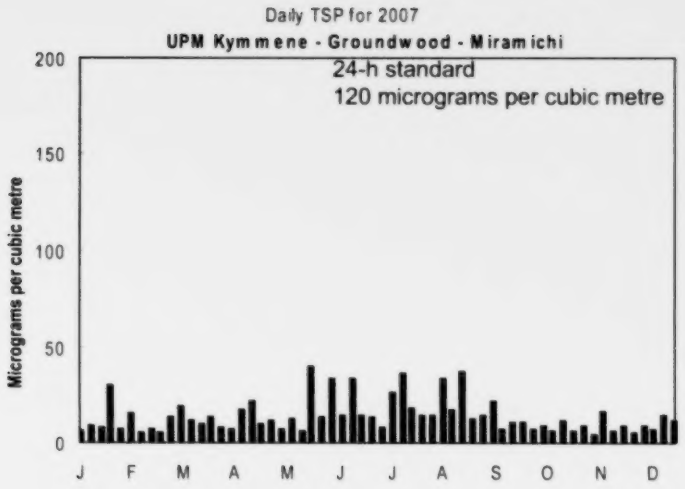

Daily TSP for 2007
Weyerhaeuser - Miramichi - Morrison Cove
24-h standard
120 micrograms per cubic metre
Industry closure
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

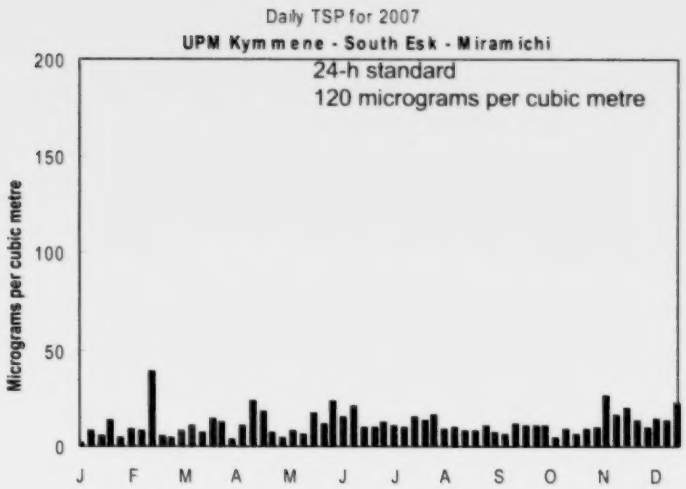

Daily TSP for 2007
Weyerhaeuser - Miramichi - Fire Ponds
24-h standard
120 micrograms per cubic metre
Industry closure
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

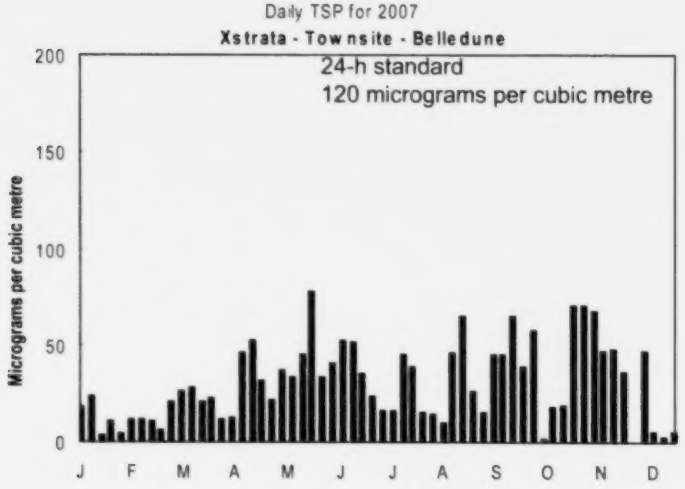

Daily TSP for 2007
NB Power Millbank - Rockcliff
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

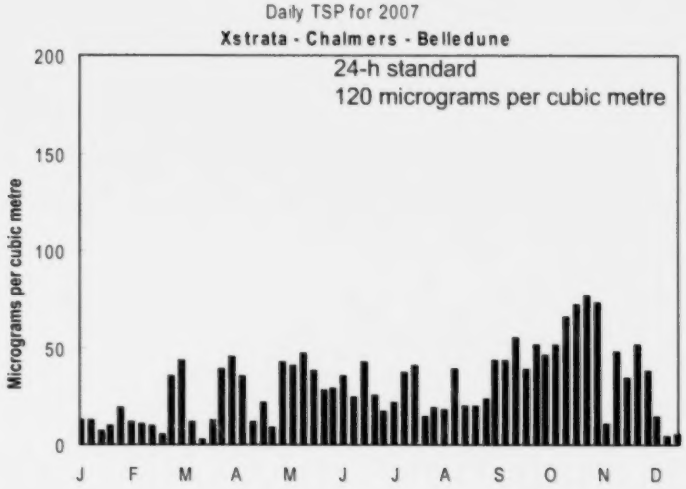

Daily TSP for 2007
AV Nackawic - Caverhill Rd
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D

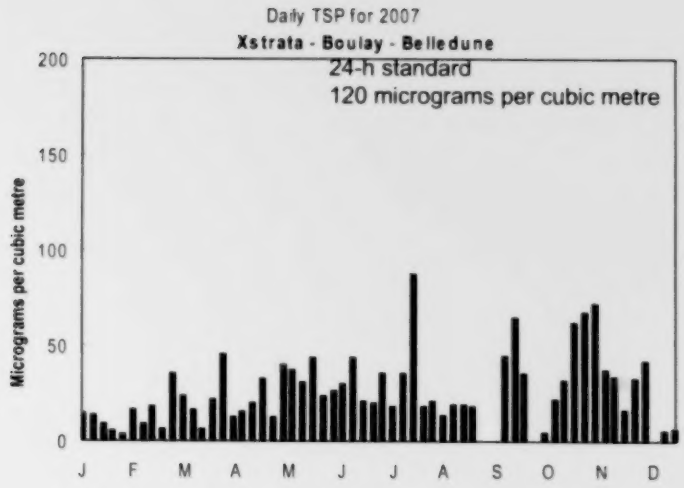

Daily TSP for 2007
UPM Kymmene - King George Hwy - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2007
UPM Kymmene - Groundwood - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2007
UPM Kymmene - South Esk - Miramichi
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2007
Xstrata - Townsite - Belledune
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2007
Xstrata - Chalmers - Belledune
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J F M A M J J A S O N D


Daily TSP for 2007
Xstrata - Boulay - Belledune
24-h standard
120 micrograms per cubic metre
Micrograms per cubic metre
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

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